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AUTOMOTIVE INDUSTRIES

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SEPTEMBER 10, 1938

ANNOUNCING

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<i>Impact Strength, energy to break, ft. lbs.</i>	$0.4 - 1.8$
<i>Tensile Strength, lbs./sq. in.</i>	$3,000 - 6,500$
<i>Transverse Strength, lbs./sq. in.</i>	$6,000 - 7,000$
<i>Softening Point, °F.</i>	$180 - 250$
<i>Hardness, Rockwell-R</i>	$80 - 120$
<i>Water Absorption, 96 hrs. room temp.</i>	$1.5 - 3.0\%$
<i>Dielectric Strength (step method), V/mil.</i>	$325 - 400$
<i>Resistivity, megohms-cms.</i>	$1 \times 10^6 - 10^8$
<i>Molding Shrinkage, in/in</i>	$0.0025 - 0.008$

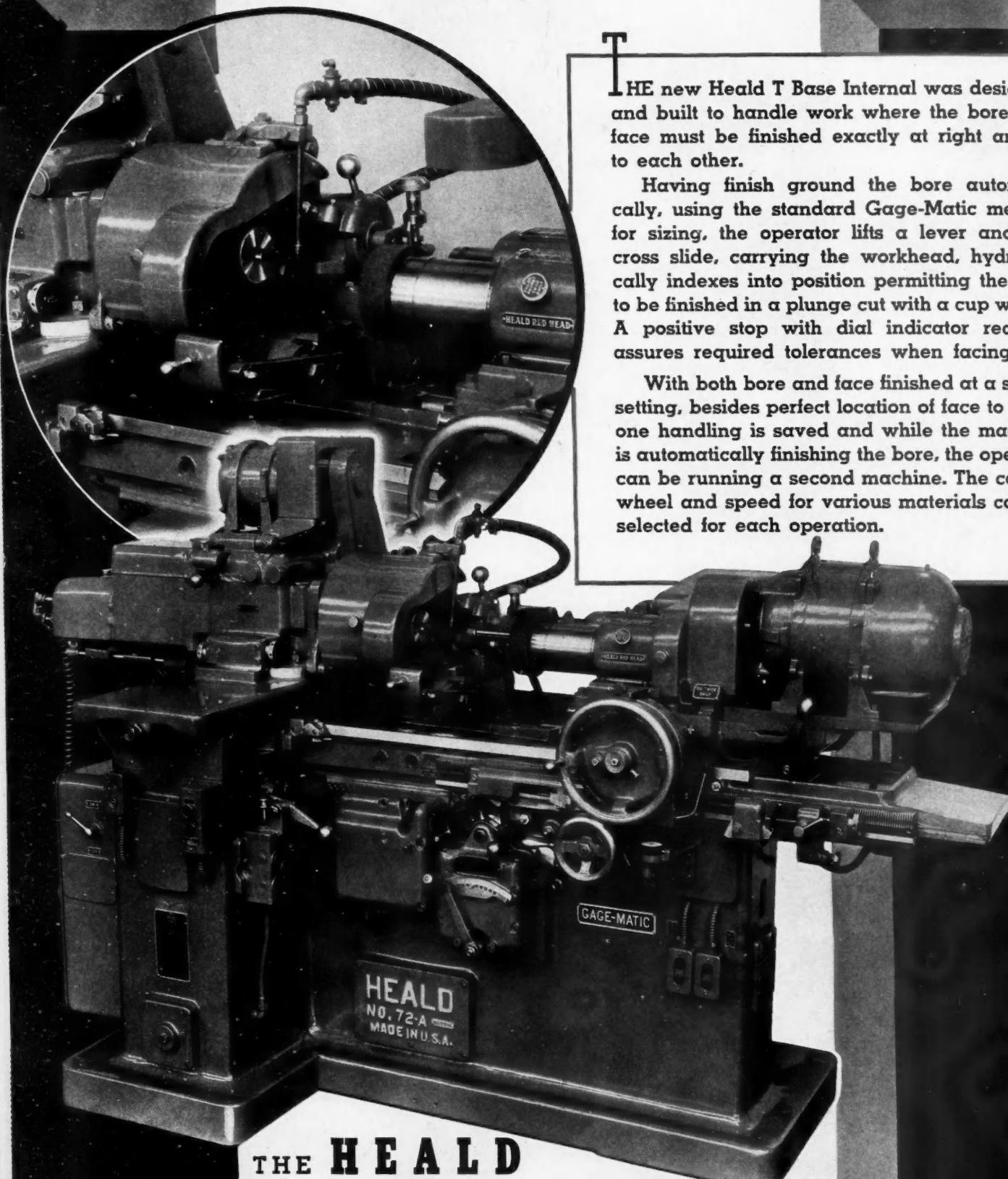
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At Same Setting

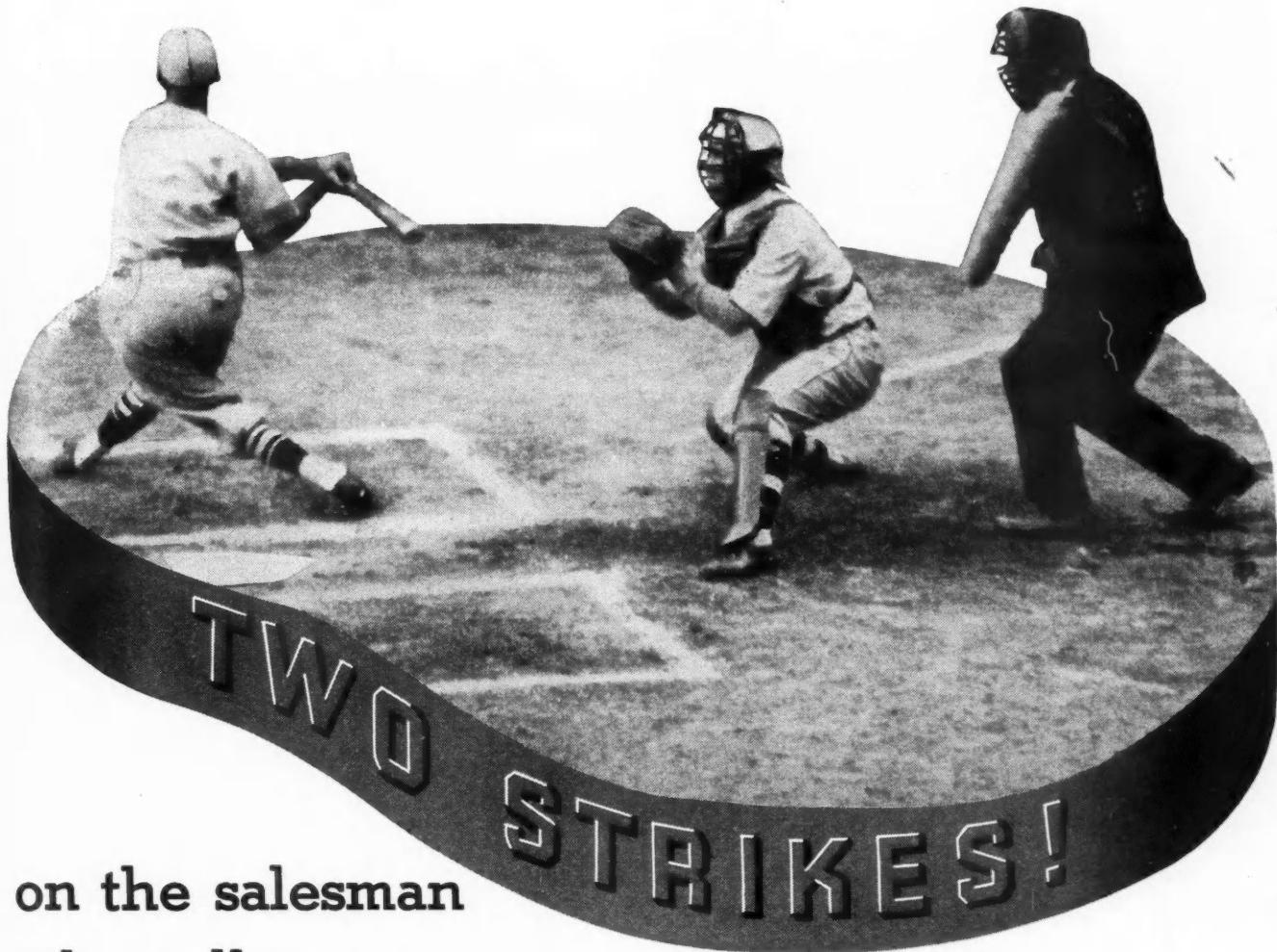


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THE **HEALD**
MACHINE COMPANY
WORCESTER, MASSACHUSETTS



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who sells cars
without

Hydraulic Braking

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In other words, motorists have learned that Hydraulic Braking is better braking. And motorists want the best, especially when it costs no more!

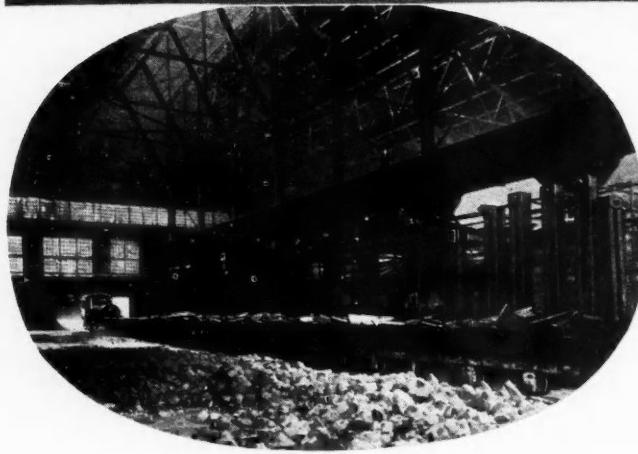
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Detroit, Michigan

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September 10, 1938

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Automotive Industries

AUTOMOTIVE INDUSTRIES



COL. ROSCOE TURNER

... who, on Monday, closing day of the National Air Races at Cleveland, won the Thompson Trophy Race with his Twin Wasp-engined Turner-Laird Pesco plane. He averaged 283.419 m.p.h. for the thirty circuits of the 10-mile quadrilateral course to set a new closed-course speed record in eclipsing the 264.261 m.p.h. mark established in the Thompson race two years ago by Michael Detrovat of France.

Production

Studebaker, Pontiac, Packard, Willys, Assemble New Models

With several additional producers getting under way on their 1939 models during the current week, production estimates covering cars and trucks showed an increase over the preceding week, although any figures based on final assemblies still fail to offer a true picture of activity in the industry.

A preliminary survey of factory schedules indicates that output of cars and trucks for the week ending Sept. 10 should approximate 23,000 units. Principal contributors to this total were Ford, Plymouth and Buick, who between them were expected to be responsible for around 18,000 units. Ford's output still con-

sisted of 1938 models, of which this week was expected to be the last. Buick and Plymouth, on the other hand, were well under way on 1939 production.

To the list of producers now completing final assemblies of their new models may be added Studebaker, Pontiac, Packard and Willys. Studebaker expected to complete 1064 cars and trucks and the others, although in production, were still well below normal anticipated schedules. One or two additional manufacturers were expecting to run pilot cars through to final assembly next week.

The monthly estimate of car and truck production released by the Automobile Manufacturers Association indicates that preliminary estimates for August will have to be revised upward slightly. The AMA estimate for August production of cars and trucks totals 91,300 units.

To date, Plymouth is the only manufacturer who has permitted parts of the public to see its new models as a result of its surprise decision to take advantage of the record-breaking crowds attending the

Michigan State Fair in Detroit. New York also was expected to have a chance to see the new Plymouths toward the end of the current week at a preliminary exhibit planned for the International Salon in the Chrysler Building.—J.A.L.

War Department Program Plans Approved

Presidential approval of the War Department's plan of procedure under the educational orders program and a \$2,000,000 allocation for the placing of orders during the current fiscal year was announced early this week by Assistant Secretary of War Louis Johnson.

The approved plans, submitted by a seven-man board headed by Brig. Gen. Henry H. Arnold, call for invitations to be sent soon to selected manufacturing companies which, in the judgment of the Secretary of War, are considered competent to manufacture particular munitions in time of war.

(Turn to page 307, please)

AUTOMOTIVE INDUSTRIES *Summary of Automotive Production Activity (Week Ending Sept. 10)*

BUSES Operations continue between 50 and 65 per cent "normal" with no indications of immediate improvement. Producers await with interest outcome of negotiations in which New York City hopes to replace elevated line with bus operation during six-year period of subway construction.

TRUCKS Little change in operations. One large producer states it is operating about 30 per cent behind last year same period. Another large producer reports August sales ahead of July and ahead of August last year. Mounting sales expected to be reflected in increased production after the middle of this month. Business reported still fairly good on smaller truck units, however it "could be better."

TRACTORS Situation virtually unchanged since last week's report. Announcement has been made of small tractor-drawn combine to go into production Jan. 1.

MARINE ENGINES One plant reports it is working at 50 per cent of capacity with outlook not very promising. General opinion continues to be that winter months will be quiet in this line.

AIRCRAFT ENGINES Production maintained at same high pace with no reports of new large orders to date. New sizeable contracts of British Government call for all engines to be made in England and installed in Canadian built planes.

This summary is based on confidential information of current actual production rates from leading producers in each field covered. Staff members in Detroit, Chicago, New York and Philadelphia collect the basic information, in all cases from official factory sources.

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Twelve-Four Vauxhall Announced

*Resembles Last Year's Ten-Four in Design
with Same Chassisless Construction*

At the London show in October Vauxhall (owned by General Motors) will exhibit a new model in the form of a four-five passenger car with a four-cylinder engine of 12 hp. by British rating, the bore and stroke being 69.5 x 95 mm. (2 $\frac{3}{4}$ x 3 $\frac{3}{4}$ in.) and the piston displacement 1442 cc. (88 cu. in.). It will supersede the Twelve-Six (1531 cc.), a model that has been current for some years past and was, with the de luxe version having a 14 hp. (1781 cc.) engine, the first Vauxhall to be fitted with independent front suspension.

The Twelve-Four differs throughout from the Twelve-Six, but in design bears close resemblance to the Ten-Four (1203 cc.) introduced at this time last year. It has, for instance, the same type of chassisless construction and the same independent front suspension; the latter embodies torsion bars and tubes instead of springs, with heavy coil springs acting on toggles to increase the stiffness of the suspension in response to severe road shocks and reduce it below normal when inequalities of road surface are slight. This system of suspension was illustrated and described in AUTOMOTIVE INDUSTRIES Nov. 6, 1937, page 69, where also appeared a shadow view of the integral body and chassis of the Ten-Four.

The Twelve-Four engine has overhead valves in a combustion chamber reminiscent of the Chevrolet, viz., of roughly inverted V form in cross section, with a correspondingly shaped piston crown having a hemispherical indentation on the side adjacent to the spark plug. Vauxhall describes this as a "controlled flame combus-

tion chamber" and claims that it excels in anti-detonating effect and consequential benefits. At 4000 r.p.m., the peak of its power curve, the engine develops 40 b.h.p. Exceptional fuel economy is claimed (35 miles per Imperial gallon is specified under average running conditions) and this is ascribed first, to the relatively low weight of the car (approximately 2100 lb.), arising from the chassisless construction, and, secondly, to the Vauxhall "six-phase carburetion," which implies a carburetor with an accelerating pump and two air bleeds of which the second opens only at part throttle.

A point of note is that normal cylinder lubrication is supplemented by a jet of oil delivered from a small hole drilled through the top of each big-end; this occurs once per revolution, viz., when the hole comes into alignment with the oil outlet from the crankpin to the big-end bearing.

British practice is departed from in the provision of a thermostatically operated valve diverting exhaust gases on to a vaporizing chamber during the warming-up period, while the provision of only three speeds (synchromesh on second and high) is also a point of difference from nearly all other British cars of this rating and larger.

Rear springing is by half-elliptics, which have non-squeak interleaving and are rubber mounted on the rear axle; they have single-acting shock absorbers, while those at the front are double-acting. Wheels are of the pressed-steel spoke variety and brakes are hydraulic with ribbed "Lepaz" iron drums.

Two styles of this new Vauxhall

are to be offered, one with a fixed (all-metal) roof at £189 and the other with a flush sliding roof at £198. Both have leather upholstery, but that of the sliding roof, or de luxe, model is hand-buffed furniture hide; other differences accounting for the higher price are the provision of a folding central armrest and footrests at the rear, sun visors, assist cords and roof net, no draught ventilation and fenders and lamps colored to match the body, instead of being black as in the lower-priced version.

Canadian Aircraft Companies To Share in New Contracts

The whole Canadian airplane industry is to be mobilized in the manufacture of fighting machines, as a result of the negotiations just concluded between the British air mission and the industry in Canada. Announcement to this effect was made in very general terms by the British High Commissioner, Sir Francis Floud. Sir Francis stated that this was done with the authority of the British Government and the assent of the Government of Canada, which has facilitated the arrangement, but is not a party to the contract.

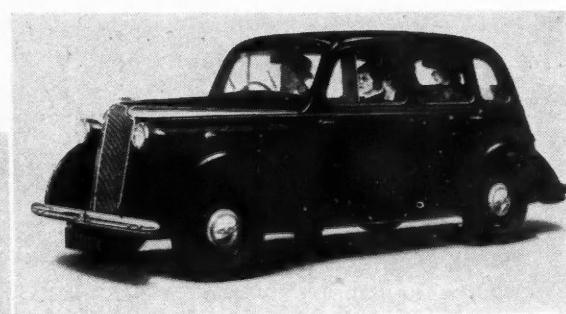
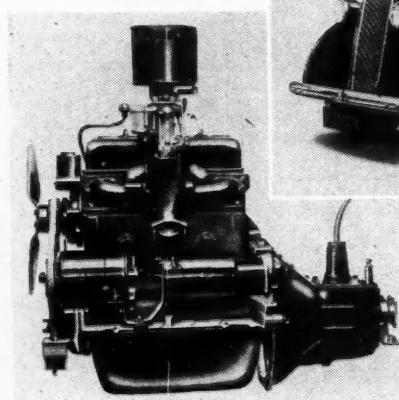
Of the extent of the order, either initially or ultimately, no estimate is made. The inference, however, is that it will depend upon the capacity of the industry and its performance in executing the original contracts.

Representatives of the central company are very shortly to go to London to find out the particular type of bomber planes which are desired and to conclude other details. The anticipation is that the contracts will be executed in London. Only the planes will be made in Canada, at least at the start. The engines will be imported from England; installed in Canada and the finished machines will be flown back across the Atlantic.

... slants

DIESELS—Said C. F. Kettering, vice-president of General Motors Corp., as he sailed recently for Europe, "I see the Diesel engine as absolutely displacing steam on the railroad." Mr. Kettering said the Diesel engine in pleasure automobiles is a long way off "but for railways and commercial vehicles it is here now."

WHY SHOW?—Ward's Automotive Reports states, "Indications that almost all manufacturers will announce

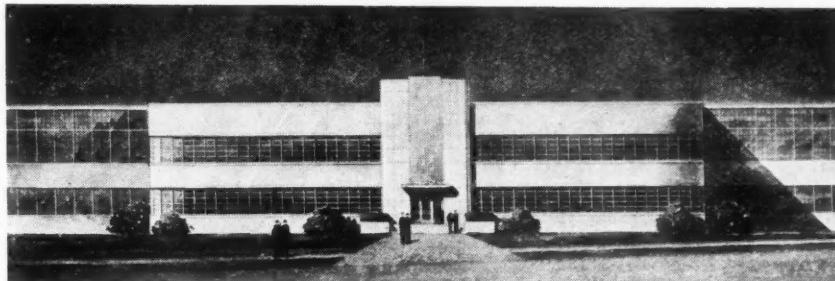


The new Vauxhall Twelve-Four and engine. Wheelbase is 101 $\frac{1}{4}$ in. Interior has maximum width greater than track being 52 in. wide at rear seat, 51 $\frac{1}{2}$ in. wide at front seat.

their 1939 models even further in advance of the major automobile shows starting Nov. 11 raises the question—Why an auto show?"

PREDICTION—Speaking at a meeting in Detroit on Tuesday, W. S. Knudsen, president, and R. H. Grant, vice-president of General Motors Corp., predicted a 25 to 35 per cent increase in automobile sales for the coming year.

SAVINGS—According to figures compiled by the Goodyear Tire & Rubber Co., in 1926 a 4.40-21 tire for light cars cost the consumer \$23.95 or \$1.55 per lb. and gave an average of 14,200 miles. Today a 6.00-16 tire for the same light cars costs the motorist \$19.35 or \$0.994 per lb. and gives an average of 26,500 miles. Thus a saving of \$33.90 per year for each of the 15,260,226 light car owners in this country.



CONSTRUCTION

Harlow H. Curtice, president of the Buick Motor Co., has announced that work will start immediately on the new building, architect's drawing of which is shown, to provide space for ser-

vice parts manufacturing, storage and shipping facilities. More than 350,000 sq. ft. of floor space will be provided in this project which is a major item of the expansion and rehabilitation program started by Buick two years ago.

Labor-Employer Relations Report

*President's Commission Files Results of Survey
Made in Great Britain*

President Roosevelt's nine-member commission which surveyed labor-employer relations in Great Britain—a study in which CIO Chairman John L. Lewis declined CIO participation—reported to the White House that violence on the part of workers and provocative tactics by employers have for some time played no significant part in industrial disturbances in Great Britain and that the country relies chiefly for the maintenance of industrial peace upon voluntary collective bargain machinery rather than on legal compulsion or legislation.

Describing the British collective bargaining process as "intricate" and of a "diverse nature," the comprehensive report traces the development of labor unions since 1825 up through the present era, and points out that "collective agreement," negotiated by employers associations and unions as integral parts of the collective bargaining machinery, have proved highly successful because they rest on "moral force rather than on legal compulsion."

"We could find no desire on the part of either employers associations or unions to seek legislation which would make the voluntary agreements legally enforceable," the President was told in the report. "On the contrary, perhaps the chief characteristic of the attitudes of both groups is that legal sanctions for these agreements are undesirable.

Members of the committee, designated on June 16 by President Roosevelt, who said he saw a definite need for an impartial report on the subject, made no attempt in the report to draw parallel lines between conditions in Great Britain and this country but merely confined their statement to a factual report on conditions

as they found them. Neither did they make any recommendations.

Mr. Roosevelt in naming the commission said the purpose of the survey was to clear up a great deal of misunderstanding concerning the British law rather than to use the material as a basis for revising the Wagner Act but the CIO promptly criticized the move, insisting it would not be a party to any cover to attack the National Labor Relations Act. It has frequently been coupled with reports that the Administration was ready to propose Wagner Act amendments although the Administration is expected to shy away from such a move when it comes to a final showdown.

On the question of strikes, the committee said that since collective bargaining became generally accepted they had resulted in little violence or provocation. Where strikers involved enough workers to make continued operation impractical, the report explained that employers "almost invariably shut down their plants and do not attempt to operate until the controversy has been settled by negotiation." Reasons cited by the committee were that in strongly organized industries it is difficult to obtain replacements and that even where organization is slight there is a general feeling among workers and employers that "the job belongs to the man" and "that it is not right for men to take, or to be asked to take, the jobs of their fellows." In the final analysis, confidence on both sides in peaceful negotiations means there is a minimum of bitterness.

In many sections of the report the general strike of 1926 was cited as an exception to an otherwise good
(Turn to page 326, please)

Form Aircraft Engine Firm

Formation of a corporation to produce a new type airplane engine in Milwaukee, Wis., has been announced. Incorporation papers will be taken out shortly for Sky Motors, Inc., according to W. H. Eggebrecht of that city, who, with H. J. Ziemann, president of the Empire Level Co., has financed a series of experiments on the engine over a period of four years.

It was stated that the engine is an air cooled type with four cylinders in line. While the engine passed all private tests several months ago, it was said, plans for its production were delayed until the United States Bureau of Air Commerce granted an approved test certificate.

Mr. Eggebrecht said that rating for the engine received from the air bureau was 60 hp. at 2000 r.p.m. Unofficial tests showed 70 hp. at 2400 r.p.m., he said.

Ford Canadian Production

Because of reduction in both export and domestic business, production of Ford Motor Co. of Canada, Ltd., Windsor, Ont., was down 12 per cent in the first seven months of 1938 from the level reached in the corresponding period of 1937, according to W. R. Campbell, president and general manager. Ford accounted for 43 per cent of total Canadian automobile production in the latest period, he stated. The company was able to maintain its employment within one per cent of 1937 totals so far this year.

Ourselves and Government

A weekly check list of legislative, executive and judicial actions affecting the automotive industries. First appeared in June 25 issue, p. 831.

Corrected to Sept. 8

CONGRESS

Adjourned June 16, sine die. All members of House and 36 Senators retire or face election in Autumn.

Legislative Legacies

MONOPOLY INVESTIGATION. The 12-member National Economic Committee is scheduled to issue subpoenas to business firms soon for production records, books, correspondence and additional information desired by the six Government departments participating in the inquiry. Steel, oil and insurance companies may be named in the first subpoenas. The full committee will meet in Washington for the first time next week and date for the first hearing is expected to be set then. Present indications are that hearings will start about mid-October and that the insurance inquiry will be the first taken up.

WAGES & HOURS. Administrator Elmer F. Andrews says that the automobile and steel industries will not be taken up for "a long time to come" because of the comparatively high rates of wages paid in these industries. He has announced the appointment of Arthur L. Fletcher, North Carolina Labor Commissioner as assistant administrator in charge of the wage-hour compliance division. The administration plans to obtain compliance through state agencies wherever possible. Andrews also has named Paul Sifton, executive director of New York's unemployment insurance replacement division, as Deputy Administrator.

AIRLINES. Members of the Civil Aeronautics Authority, the Administrator and the members of the Air Safety Board were scheduled to hold their first informal conference with air line operators and members of the Air Transport Association of America in Chicago on Tuesday concerning problems confronting the industry.

DEPARTMENT OF JUSTICE

MONOPOLY. Status unchanged since report in AUTOMOTIVE INDUSTRIES issue of Aug. 13.

DEPARTMENT OF LABOR

CONTRACTS. Public Contracts Board reports government contracts for the week ended Sept. 1 totaled \$89,253.53 for transportation equipment; \$268,017 for "other machinery." One contract for \$28,538.98 called for an undisclosed number of automobiles and trucks to be supplied the Panama Canal by the General Motors Corp.'s Chevrolet Division; another was for \$21,850 awarded the Jim Reed Chevrolet Co., Nashville, Tenn., for FSA trucks; a third was for \$23,779.55 for safety belt assemblies to be supplied the Air Corps by the Aerial Machine & Tool Corp., New York. Contracts classified as for "other machinery" included a \$87,075 contract for boring and turning machines for the Navy awarded to General Machinery Corp., Niles Tool Works Division, Hamilton, Ohio; another for \$38,477 for FSA air compressors awarded the Chicago Pneumatic Tool Co., Philadelphia; and one for \$17,220 for tapering presses awarded the Waterbury Farrel Foundry & Machine Co., Waterbury, Conn., by the Ordnance Division, War Department.

STEEL LABOR. Deadline date for filing final briefs was Aug. 22 and the Board is expected to hand down its recommendations within the next week which, if approved by the Secretary of Labor, will establish the minimum wage rates below which manufacturers will not be permitted to pay their employees if they wish to be eligible for Government contracts. Board plans to eventually cover all industries doing business with the Government including the automobile industry although it may be among the last to be considered.

AIRCRAFT LABOR. Representatives of

the aircraft manufacturing industry told the Public Contracts Board on Thursday that in recommending a minimum wage of 60 cents an hour for workers in the industry the board had strayed from its assigned field of fact finding to actual policy making.

Leighton Rogers, president of the Aero-nautical Chamber of Commerce, in a public hearing called at the request of the chamber, testified that the group of productive employees receiving from 17 and one-half cents to 60 cents an hour had not been adequately taken into account by the board and that to fix the recommended minimum of 60 cents would be to disregard 25 per cent of the employees as a whole, and from 17 per cent in the engine division to 36 per cent in the instrument division of the industry.

Members of the Board, who on April 5 recommended the 60 cent minimum with 15 per cent of workers in any one plant permitted to be classified as learners and paid a 40 cent minimum, indicated they were out of sympathy with the contention of chamber representatives, insisting that all wages paid in the industry had been used in determining the prevailing minimum wage on which they based their recommendations.

Mr. Rogers and other representatives of the industry conceded that the learner problem was one of the most perplexing to the industry in giving the board data on which to base a decision and asked that several spokesmen be allowed to testify as to their individual factory experience. More than 30 industry representatives attended the session, a continuation of the original hearing held last April.

The Walsh-Healey Board's job is to propose minimum wage rates for employees in industries doing business with the government.

In order for firms to become qualified for government contracts they must adhere to the minimum pay prescribed by the Secretary of Labor after the Board's recommendations are adopted.

INTERSTATE COMMERCE COMMISSION

EFFECTIVE Oct. 1, the ICC has prescribed a maximum driving day of 10 hours to be followed by an 8-hour off-duty or rest period, or a weekly limitation of 60 hours on duty, for truck and bus drivers of common and contract motor carriers. The Public Health Service has been directed to conduct studies covering the fatigue problem, and the ICC Motor Carriers Bureau will make further studies of accident reports "for the light they may throw on the effects of safety of operation of different periods of duty."

FEDERAL TRADE COMMISSION

INVESTIGATION under the Withrow-Minton Resolution (M. J. Res. 351), Status remains unchanged since report in AUTOMOTIVE INDUSTRIES issue of Aug. 13.

F.O.B. PRICES case vs. G.M. and Ford. Hearings expected to open this month with exact date to be fixed later. Complaint alleges price advertising misleading because of failure to include standard equipment.

V.S. GENERAL MOTORS on question of forcing dealers to purchase parts exclusively from G.M. sources. Hearing in New York, where Everett Haycraft is F.T.C. attorney in charge, were resumed on Aug. 16 and are still in progress.

SIX PER CENT CASE. F.T.C. cited Ford and General Motors in July, 1937, complaining of false and misleading representations in advertising prices of automobiles. Complaint alleges advertising 6 per cent charge on deferred payments by retail purchasers is misrepresentation because no provision is made for amortization. The case has been in the hands of the trial examiner for several weeks. The FTC brief is expected to be ready shortly, possibly next week.

FAIR TRADE PRACTICE rules for retail automobile dealers, introduced at public hearings during last NADA meeting in Detroit (see A.I., April 30, 1938), are still under study by the F.T.C. fair trade practice division headed by George McCorkle.

F.T.C. has issued a cease and desist order against the Perfect Mfg. Co., 3317 Madison Road, Cincinnati, directing the concern to discontinue advertising that its Kar-Nu liquid automobile product is a "miracle" discovery and will finish automobiles like new and produce results equal to a \$25 to \$75 point job; and that its No-Flat product, a liquid preparation placed in inner tubes, will render tires puncture-proof.

L. W. MIDDLETON, Waterloo, Iowa, has entered into a stipulation with the F.T.C. agreeing to discontinue representing Middleton's Weather Wax, an automobile polish, as an agent for restoring the original finish on cars, for stopping spotting, and that it has a different melting point than is "not in accordance with the facts."

CITIES SERVICE OIL CO., New York, has entered into a stipulation with the F.T.C. agreeing to discontinue among other things representations that Bronze Koolmotor Gasoline is full burning or contains nothing but real energy.

ROBERT E. FREER, of Ohio, 100 per cent New Deal Republican, has been reappointed by President Roosevelt to serve a seven year term as a member of the Federal Trade Commission.

NATION LABOR RELATIONS BOARD

In the Douglas Aircraft Co. (Santa Monica, Calif.) case, the Board is expected to hand down a decision shortly involving the sit-down strike. The case has been pending for a year and a half.

NLRB vs. Ford Motor Co. For latest development see news story on page 307 of this issue.

WAR DEPARTMENT

INDUSTRIAL POWER FACILITIES. President Roosevelt on Wednesday named a six-man committee headed by Assistant Secretary of War Johnson to draft legislative remedies because studies of the problem have disclosed "a shortage of power to meet the needs of the nation's industry in the event of war such as to constitute a serious threat to the national security." Other members of the special committee include Frederic A. Delano, chairman of the National Resources Committee; Basil Manly, of the Federal Power Commission; Interior Secretary Ickes; Assistant Secretary of the Navy Edison; and SEC Chairman Douglas. EDUCATIONAL ORDERS PROGRAM. See news story on page 303 of this issue.

Factory Sales Estimated at 1,547,776 for Eight Months

Total factory sales of passenger cars and trucks in August are estimated by the Automobile Manufacturers Association at 91,300 units, bringing the total for eight months to 1,547,776.

Dealer stocks were reduced during July by a further 66,000 units. The net reduction in field inventories for the first seven months was 227,600 units. Last year, during the corresponding period, dealer inventories increased by 126,100 units. Retail distribution registered a slight advance in July compared with June.

July foreign sales of 26,986 units brought the seven-month total to 315,833 cars and trucks. The proportion of vehicles going into foreign

Automobile Sales Figures

	Total ¹ Factory Sales (U. S. & Canada)	U. S. ¹ Domestic Market	Foreign Market ² (Incl. Canada) Number and %	Retail ³ Sales in U. S.
1938				
1st 6 Mos.	Cars..... 1,012,619 Trucks..... 293,413 Total..... 1,306,032	827,085 190,100 1,017,185	185,534 18.3 103,313 35.2 288,847 22.1	972,062 206,302 1,178,364
JUNE	Cars..... 147,545 Trucks..... 41,854 Total..... 189,399	123,333 27,921 151,254	24,212 16.4 13,933 33.3 38,145 20.1	156,029 33,825 189,854
JULY	Cars..... 112,114 Trucks..... 38,330 Total..... 150,444	96,975 26,483 123,458	15,139 13.5 11,847 30.9 26,988 17.9	153,426 35,468 189,894
AUGUST	ESTIMATED TOTAL	91,300 ²		
1937				
1st 6 Mos.	Cars..... 2,383,810 Trucks..... 533,059 Total..... 2,916,869	2,136,591 403,801 2,540,392	247,218 10.4 129,258 24.2 376,477 12.9	2,036,347 372,203 2,408,550
JUNE	Cars..... 429,333 Trucks..... 91,820 Total..... 521,153	387,121 66,331 453,452	42,212 9.8 25,489 27.8 67,701 13.0	365,160 64,597 429,757
JULY	Cars..... 372,913 Trucks..... 63,996 Total..... 436,909	341,189 61,178 402,357	31,724 8.5 22,818 27.2 54,542 12.0	347,120 60,925 408,045
AUGUST	Cars..... 317,270 Trucks..... 87,802 Total..... 405,072	299,496 64,514 364,010	17,774 5.6 23,288 26.4 41,062 10.1	310,312 63,353 373,665
SEPTEMBER	Cars..... 120,597 Trucks..... 55,033 Total..... 175,630	110,122 36,402 148,524	10,475 8.7 18,631 33.8 29,106 16.6	192,967 53,303 246,270
OCTOBER	Cars..... 306,040 Trucks..... 31,939 Total..... 337,979	273,753 22,595 296,348	32,287 10.6 9,344 29.3 41,631 12.3	212,651 31,510 244,161
NOVEMBER	Cars..... 309,121 Trucks..... 67,508 Total..... 376,629	269,580 48,969 318,549	39,541 12.8 18,539 27.4 58,080 15.4	212,389 28,721 241,110
DECEMBER	Cars..... 259,184 Trucks..... 88,165 Total..... 347,349	212,655 52,215 264,870	46,529 17.9 35,950 40.7 82,479 23.6	171,643 33,480 205,123

Sources: ¹U. S. Census Bureau and Dominion Bureau of Statistics.

²Automobile Manufacturers Association.

markets increased to nearly 22 per cent from slightly less than 13 per cent a year ago.

War Department Program (Continued from page 303)

The Department expects each year to designate a board of officers whose job will be to select from the complete program, which contemplates \$10,000,000 of expenditures at the rate of \$2,000,000 for the next five years, items considered as occupying positions of highest priority. The schedule for the year will then be planned accordingly.

Upon completion of an educational order, the equipment will become the property of the Government and stored until the necessity for use arises. In selecting items for inclusion under the program only those considered essential and showing promise of remaining standard over a period of time will be chosen.

Wisconsin Dealer Association Parts from NADA

Although the Wisconsin Automotive Trades Association has stated it has withdrawn from the National

Automobile Dealers Association, following a resolution adopted by its members recommending such action, it was reported at NADA headquarters that no official notice

had been received from the Wisconsin group indicating a desire to withdraw from the national association. It was pointed out that even if such official notice had been received it would be meaningless, because state associations have never been members of the NADA. Headquarters said that membership in the NADA is held by individual dealers, and that state associations, including the Wisconsin group, have merely acted as agents for the national association in the sale of used car guides and collection of dues.

Reported withdrawal of the Wisconsin group was said to have been based upon the failure of NADA leaders to comply with the terms of a resolution directing the appointment of a committee to study proposed changes in the constitution and by-laws of the NADA.

Two Ford Plants Subjects of NLRB Reports

In an intermediate report, Trial Examiner Thomas H. Kennedy has recommended that the National Labor Relations Board order reinstatement with back pay of 129 employes at the Richmond, Cal. (San Francisco Bay area) plant of the Ford Motor Co.

The Ford Motor Co. was also given 10 days, from Sept. 7, to file exceptions to a supplementary report received from Trial Examiner Francis M. Shea recommending reinstatement with back pay for 41 former employes of the Ford plant at Buffalo, N. Y.

Advertising News Notes

Stewart G. Phillips, who has been advertising manager of the Dole Valve Co., Chicago, for the past 13 years, has been named assistant secretary of that company. Mr. Phillips will continue to direct the advertising policies and activities of the company in addition to his new official duties.

Ron Gamble, youngest announcer at WJR, Detroit, was chosen late last week to succeed Truman Bradley as announcer on the Ford Sunday Evening Hour (CBS), which resumes Sunday, Sept. 11. Time 9-10 P. M.

Barney Oldfield has renewed for another year as Hollywood news commentator on KFOR with a six nights weekly program.

William Sellers & Co., Inc., Philadelphia manufacturer of machine tools, has appointed the Willard G. Myers agency, New York, to direct its advertising. Business publications and direct mail will be used.

Among the new programs, or those resuming after summer suspension, are the following of interest to the automotive world: **Tidewater Associated Oil**, starting Saturday Sept. 24. Will be on the NBC Red network weekly 2-4.45 with football games. **Goodyear Tire & Rubber**, starting Sept. 26. Will be on the NBC Blue network Monday through Friday, 1.15-1.30, with the Goodyear Farm Service program. **The Texas Co.**, starting Oct. 5. On the CBS network Wednesdays, 9.30-10.30, with the Texaco Star Theatre. **Ford Motor Co.**, as mentioned

previously, starting Sept. 11. On the CBS network, Sundays 9-10 p. m., with its symphony program.

A wide range of premiums are being offered with the purchase of new and used automobiles, by Vancouver, B. C., Limited, Ford distributors, Vancouver, B. C. Large space in local newspapers lists fur coats, golf club sets, bicycles, radios, washing machines, and other goods obtainable during the 10 day premium offer.

The Federated Sales Service, Inc., Boston, Mass., has been appointed sales and marketing counsel for Federal Metallic Packing Company, Wakefield, Mass.

New York advertising circles are impressed with the extensive use of sound pictures, direct mail, and the dramatization of the simple speedometer gadget with a warning red light which flashes when the car exceeds 35 m.p.h., the first of Plymouth's sales barrage.

John Orr Young, a founder of Young & Rubicam, Inc., is president of Atchison Agrol Co., Atchison, Kas., makers of a gasoline and alcohol blend of motor fuel.

Peter Arno has animated the "Three Little Men" trademark of Atlantic Refining Co. in a marionette show. "Carbon," a third character, has been added to the now-famous Atlantic Refining trio, originated by the late Ray Rohn. N. W. Ayer, Son & Co. has the account.

BUSINESS IN BRIEF

Written by the Guaranty Trust Co., New York

Business activity continued to expand last week, in spite of the unsettling influence of the European situation and the railway wage dispute. The index of the New York Journal of Commerce registered the seventh successive weekly gain, standing at 80.4, the highest since last November, as against 78.3 a week earlier and 101.3 a year ago. Retail trade was affected to some extent by seasonal dullness incidental to the shift in emphasis from summer to autumn goods, but this factor was more than offset by increased buying in sections where industrial expansion and farm marketing have swelled purchasing power.

The movement of railway freight rose to a new high point for the year during the week ended Aug. 27. Loadings during that period totaled 620,511 cars, showing an increase of 22,593 cars, or 3.8 per cent, above the figure for the preceding week but a decrease of 162,965 cars, or 20.8 per cent, below that for the corresponding period last year.

Production of electricity by the electric light and power industry declined slightly during the week ended Aug. 27. Output in that period was 7.0 per cent below that in the corresponding week a year ago, showing the smallest decline below last year's figure in three weeks.

Debits to individual accounts by banks in leading cities for the week ended Aug. 24 were 10 per cent

below the total reported for the preceding week and 12 per cent below that for the corresponding period last year.

Average daily crude oil production for the week ended Aug. 27 amounted to 3,388,500 barrels, showing a decline of 4200 barrels from the average for the preceding week. The current figure compares with a daily average output of 3,731,450 barrels a year ago and an estimated demand of 3,438,100 barrels calculated by the Department of the Interior.

Combined second quarter net profits, less deficits, of 265 industrial and mercantile companies showed a decline of 70 per cent below the total for the corresponding period a year ago, according to a study by the Federal Reserve Bank of New York. Profits in the second quarter were somewhat larger than in the first quarter, but the rise appears to have been less than seasonal.

Professor Fisher's index of wholesale commodity prices rose for the second successive time last week, standing at 80.6, as against 80.4 a week earlier and 79.9 two weeks earlier.

Member bank reserves increased \$23,000,000 during the week ended Aug. 31, mainly as a result of a rise of \$56,000,000 in the monetary gold stock, partly offset by an increase of \$33,000,000 in the amount of money in circulation. Excess reserves, however, were estimated at \$2,940,000,000 on Aug. 31, showing a decrease of \$40,000,000 for the week.

Motors Corp., has been made western sales manager, replacing D. N. Larson, who has resigned.

FRANK D. NEWBURY has been appointed manager of the new products division of the Westinghouse Electric & Mfg. Co. to succeed Herbert Mygatt Wilcox who died July 28. In addition to this development of activities for Westinghouse in new fields, Mr. Newbury will continue his present duties as economist for the company.

R. C. REICHEL is now Detroit district representative and manager of the Graham-Paige Motors Corp. retail sales and service branch on Cass Avenue, Detroit. Mr. Reichel was formerly associated with the General Body Corp. where he served as general manager.

Promotion of two divisional sales managers to posts as assistant general sales managers of the Nash Motors Division of Nash Kelvinator Corp. has been announced

by W. A. Blees, general sales manager of the division:—

R. H. ISRAEL, who also is president and director of Nash Motors Co. of New York, has been made assistant general sales manager of the division for the East. His headquarters will continue in New York.

O. L. ARNOLD formerly stationed at Kenosha, Wis., has been shifted to Nash sales headquarters in Detroit, as assistant general sales manager for the West.

Fairchild Report

Fairchild Engine & Airplane Corp. reports consolidated net loss of \$44,671 for the six months ended June 30. This compares with \$346,548 loss for the twelve months ended Dec. 31, 1937.

Sherman M. Fairchild, president of the company, pointed out that the airplane subsidiary showed \$19,861 operating profit, against \$64,000 loss in the first half of 1937. Net loss of \$43,759, however, was shown by the engine manufacturing subsidiary, due to development and exploitation expenses connected with its in line type engines. A contract for engines and further development work has been received from the United States Navy.

LeRoy Pelletier Dies

Was Colorful Figure in Early Days of Automobile Industry

E. LeRoy Pelletier, 72, Henry Ford's first advertising manager and a pioneer himself in the automobile industry, died in the Henry Ford Hospital, Detroit, Sept. 5.

Pelletier entered the automobile industry in 1901. Before that time he had won fame as a newspaperman in his coverage of the Klondike gold rush in 1897. Tales of Klondike veterans told how he had organized the "Jackson money exchange" and reputedly sold through the agency a third of the Klondike region.

In 1905 Pelletier became Ford's consulting engineer, secretary and publicity manager and is credited with having been the first man to make the public "Ford conscious." It was he who began building up Ford as a personality in the new and fast moving industry. He was among the first to bring to automobile press agentry a style that differed from the then prevailing mass of material on technical facts and methods and substituted colorful items that made news headlines.

Through his association with Ford and his own designing of what is said to have been the first four-cylinder air-cooled automobile at the turn of the century, Pelletier was widely known in the industry. He was pres-

MEN OF THE INDUSTRY

R. EARL BURROWS has been appointed manager of the Cleveland Automotive Trade Association.

W. L. BAYER has been elected chairman of the board of Noorduyn Aviation, Ltd., Montreal. **R. G. HOLT** has been named president.

HERMAN W. FALK and **LESTER ARMOUR** have been elected directors of Allis-Chalmers Mfg. Co. Mr. Falk was also elected a member of the executive committee.

W. G. NORTHRUP, recently appointed special representative of Graham-Paige



E. LEROY PELLETIER

... began wearing Windsor ties a year after the death of his friend, Elbert Hubbard, because Hubbard had once asked him to. He wore only Windsors though he had to go to children's departments in stores to buy them.

ident of the company which built his automobile—the "Duquesne."

Mr. Pelletier was later advertising manager in charge of sales promotion for the Rickenbacker Motor Co.

Air Exports Up Despite Contraband Rules

Exports of aircraft and aircraft engines represented more than 30 per cent of the total deliveries of \$73,031,816 in value during the first six months of this year, although the industry is rigidly holding to the government's rules on contraband war materials.

Probably none of the airplanes shot down in Spain and reported by foreign news service as "American-made" were actually made in the United States, but were copies of American design and manufacture built in other countries, the Aeronautical Chamber of Commerce told AUTOMOTIVE INDUSTRIES this week.

It is possible that overseas fighting forces have been supplied with American ships and engines through other countries. Canadian, Russian, and manufacturers of other countries have license arrangements with American aircraft and engine builders, such licenses having been arranged long before international hostilities.

It was recalled by the Chamber

that Russian officials made license arrangements with American machine tool, aircraft, and engine builders a number of years ago, and hired American engineers and production experts to build factories and set up schedules of operation.

The fact that America led the world in establishing a national aeronautical laboratory, the National Advisory Committee on Aeronautics, was given as one reason why Russia was inclined to adopt American design. Russia has taken the advantages which accrued from the pioneering research work done by the N.A.C.A. by adopting American design which in turn was based largely on the committee's findings.

Other countries have established similar research and experimental facilities in recent years, according to Reginald Cleveland, Jr., of the Aeronautical Chamber of Commerce. The new French laboratory at Ville-

coublay, the German establishment at Berlin-Tempelhoff, the British experimental plant at Farnborough, and the Italian laboratory at Guidonia, near Rome, are all equipped to do work similar to that of the N.A.C.A., he pointed out.

Although aircraft designed and built especially for warfare are the most efficient for this purpose, any nation at war will press into service any type of airplane and equip it for fighting. Both in Spain and in China, the opposing armies have numerous airplanes designed and built for private use, foreign newspapers' correspondents have found.

None of the airplanes fighting in Spain, where American war materials are contraband, were shipped there by American manufacturers, or reshipped to Spain from other countries with either the knowledge or consent of American manufacturers, the chamber asserted.

Automotive Metal Markets

End of Slack Period Finds Rolling Mills Well Equipped to Handle Orders Promptly

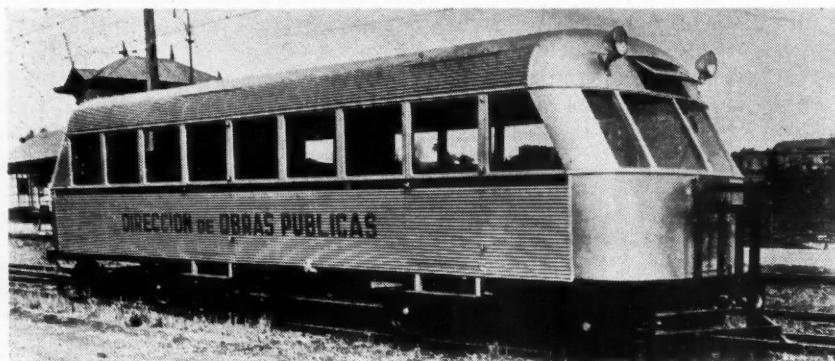
Going into operation in the Chicago steel-producing district of a new continuous strip mill, with a nominal capacity of 45,000 tons per month, comes as a reminder to the steel market that rolling and finishing capacity is still being added to. Moreover, innumerable improvements have been made in rolling mills generally during the slack period, which now has happily come to an end. The steel industry today is in better shape mechanically to fill orders promptly than it has ever been. Modern continuous flat rolled steel set-ups permit of speedy adjustment in response to varying specifications, and a recurrence of such delivery delays, as were common in years gone by when demand staged a sudden upsurge, is virtually precluded, even though steel consumption should develop more of a bulge than is generally anticipated.

For the current five-day week the American Iron & Steel Institute reports 39.9 per cent of rated ingot capacity in operation, which compares very favorably with last week's six-day record of 44 per cent. While the steel market, as a whole, was slow in resuming its wonted activities following the Labor holiday, it was reported that business from virtually all automobile manufacturers was in progress of negotiations, and that parts makers were also placing moderate-

sized orders. Up to Tuesday there had been no formal announcement of fourth-quarter prices, usually publicized late in August, but no one looked for any major changes. If there are any price revisions at all, they are expected to apply to a few items out of line with the price structure in general. Now that production activities in automobile and parts plants are getting under headway, steel mills look for a more free flow of those grades of scrap steel which emanate chiefly from automotive plants, such as hydraulically compressed sheet steel scrap and borings and turnings, and which were in rather scant supply in the last few months.

European developments made for a rather halting tone in the non-ferrous metal markets. Electrolytic copper continued to be quoted by producers at 10 $\frac{1}{8}$ cents, with a little metal offered by outside holders at around 10.05 cents. London cables indicated that European metal interests, for the time being at least, did not consider the war clouds as a bullish factor.

The decline in Sterling exchange to the lowest level in more than three years held the price of tin in check. Activity in that metal was virtually nil on Tuesday, and the market for spot Straits tin may be nominally quoted at 43 cents.—W. C. H.



RAIL BUS Engine-driven buses running on rails are said to be rapidly winning popularity as common carriers in Chile, South America. The unit

shown here was designed by Copetta & Robin, Santiago engineers. It is powered by a Ford V-8, 85 hp. engine and carries 35 passengers and driver.

General Motors Patents Rear-Engine System

General Motors Corp. has patented a system for rear-engine operation of automobiles.

Although none of the manufacturers of popular types of automobiles has indicated any early intention of marketing a rear-engined machine, Henry Ford also obtained recent patents for such a vehicle (see p. 208, Automotive Industries for Aug. 13).

The General Motors device, invented by Eric Ollie Schjolin, of Pontiac, would connect the conventional clutch pedal and gear-shifting lever with the rear engine by means of metal ribbons.

The patent indicated that the device was designed to be used in connection with a conventional automobile engine. However, the engine block and the housing of the rear axle would be in one piece, it was believed.

Buffalo Plant of Chevrolet To Triple Output

Plans of the new Chevrolet engine and axle plant in Buffalo, to increase production sharply when it goes into active operation Sept. 12, have crystallized into a decision to more than triple output, Alfred G. Gulliver, plant manager, announced. Previously, it was thought production would be doubled.

The plant, which will add truck axles to its previous line of passenger car axles and engines, will step up production to 480 engines and 480 axles a day. Employment will be increased to around 2000 persons. Before the seasonal shutdown several weeks ago, output was on the basis of 150 engines and 150 axles a day with employment around the 1000 level.

Preparations for the high level of

operations already are underway and 25 per cent of the furloughed employees are back at work.

40 Years Ago

with the ancestors of
AUTOMOTIVE INDUSTRIES

Haynes-Apperson Carriages

The Haynes-Apperson Co., Kokomo, Ind., are now producing two carriages a week. Devoting themselves exclusively to the manufacture of motor carriages, and being one of the pioneers in the business, they are able to turn out a vehicle which they can guarantee will give satisfactory service on the road.

One of their carriages, with trailer attached, recently made a quick trip from Kokomo to Chicago over country roads.

From *The Horseless Age*, September, 1898.

U. S. New Car Registrations and Estimated Dollar Volume by Retail Price Classes*

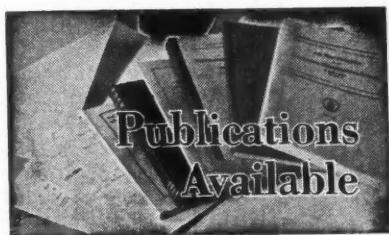
Dollar volume of U. S. new car registrations fell off \$4,000,000 from the June figure to set a mark of \$128,500,000 for July.

	NEW REGISTRATIONS			ESTIMATED DOLLAR VOLUME		
	July	Seven Months		July	Seven Months	
		Units	Per Cent of Total		Dollar Volume	Per Cent of Total
Chevrolet, Ford and Plymouth.	90,685	655,163	59.85	\$68,400,000	\$493,500,000	51.97
Others under \$1000.	31,702	241,706	22.08	29,000,000	221,000,000	23.27
\$1001-\$1500.	24,801	184,943	16.89	27,500,000	206,500,000	21.74
\$1501-\$2000.	921	7,805	.71	1,600,000	13,400,000	1.41
\$2001-\$3000.	602	4,387	.40	1,600,000	11,700,000	1.23
\$3001 and over.	87	749	.07	400,000	3,600,000	.38
Total.	148,798	1,094,753	100.00	\$128,500,000	\$949,700,000	100.00
Miscellaneous.	102	664				
Total.	148,900	1,095,617				

* All calculations are based on delivered price at factory of the five-passenger, four-door sedan, in conjunction with actual new car registrations of each model. The total dollar volumes are then consolidated by price classes.

elled by Martin and the reference of future disputes to the CIO for arbitration. Martin has publicly declared the proposal to be unacceptable and an attack on the autonomy of the UAW, and seemed determined to continue this attitude.

Should this position be maintained, the result could only be a permanent division of the present UAW into two separate unions, with the followers of the expelled officers continuing their affiliation with CIO and the rest following Martin into an independent set-up. Although Sidney Hillman and Philip Murray, CIO vice-presidents sent to negotiate the peace proposal with the Martin-controlled board, are reputed to be expert conciliators, opinion in Detroit was that their efforts would be unsuccessful.



A publication of the RLM Standards Institute, "The Meaning of the RLM Label", is a factual exposition of the principles of modern industrial light conditioning.*

A booklet has been published by the Acme Steel Co. dealing with concrete floor protection.*

The fourth statistical yearbook of the National Battery Manufacturers Association has just been published. Copies are available, through the association, for twenty-five cents. Address, 7 E. 44th St., New York City.

Latest State requirements for safety glass are included in a table in the August issue of the "Industrial Standardization and Commercial Standards Monthly", available through the American Standards Association, 29 W. 39th St., New York City.

H. K. Porter, Inc., Everett, Mass., advises that its new catalog describing the Porter line of cutting tools is off the press.*

Four bulletins have been published by the Kloster Steel Corp., Chicago. They describe: Swed-Oil, a manganese-chromium-tungsten steel for cutting tools, dies, and gages; Hi-Run, a high chrome-high carbon production steel for tools, and dies for swaging, pressing, coining, shearing and compressing operations; D-C-33, a low carbon-chrome-silicon-tungsten-molybdenum steel for hot working tools and dies on upsetting machines, presses and hammers handling heavy work; D-C-66, chrome-tungsten-vanadium hot work steel for tools and dies, especially where high temperatures are a working factor.*

A folder descriptive of its line of products has been issued by New Method Steel Stamps, Inc., Detroit.*

Pratt & Whitney, division Niles-Bement-Pond Co., Hartford, Conn., has brought out a new No. 15 small tool catalog.*

* Obtainable from editorial department, AUTOMOTIVE INDUSTRIES. Address Chestnut and 56th Sts., Philadelphia.

AUTOMOTIVE ABSTRACTS

The Cathode Ray Oscillograph

A paper on "The Cathode-Ray Oscillograph" was presented to the Institution of Automobile Engineers by A. Towle of Rolls-Royce, Ltd., and was awarded the First Graduates Prize by the Institution. It is pointed out in this paper that the most difficult part of such an instrument to design for satisfactory service is the pressure element. Four different principles have been made use of in the design of such elements. The element always is of spark-plug form and has a diaphragm of stainless steel exposed to the cylinder pressure. In one design of pressure element, the pressure exerted on the diaphragm is transmitted to a pile of carbon disks forming a resistance element included in an electrical circuit, and variations in the gaseous pressure change the resistance of the pile and therefore the current flow. In another pressure element, known as the Standard Sunbury, deflection of the steel diaphragm by the cylinder pressure varies the air gap in the field of a small permanent magnet, which latter carries a winding. Since the reluctance of the magnetic circuit changes with the air gap, there is a corresponding change in the flux cutting the coil, which in turn induces in the coil and electro-motive force proportional to the rate of change of the cylinder pressure.

In the latest type of Dodds pressure element, the stainless steel diaphragm, which varies in thickness from 0.010 to 0.050 in. according to the pressure range required, is separated from the inner end of the central electrode by a thin sheet of mica, so that the diaphragm and electrode together form a condenser. When the pressure acting on the diaphragm changes, the thickness of the mica sheet is altered slightly, and this varies the capacity of the condenser. This in conjunction with a sensitive electrical circuit employed allows the reproduction of diagrams representing pressure vs. time or rate of change of pressure vs. time.

Another type of pressure element, of which the Zeiss is an example, makes use of the piezo-electric phenomenon. A number of quartz crystals are employed and when subjected to pressure produce an electro-motive force proportional to the

pressure. A number of these quartz crystals are connected in parallel and are housed one above the other in the pressure element. In order to enable slight vacuums to be recorded, as during the induction stroke, the quartz pile is normally subjected to a light pressure. It is isolated from the combustion chamber by a light diaphragm, and pressure is transmitted to it by a light piston situated on the combustion-chamber side. For high-duty engines it is necessary to water-cool the element.

Either pressure-time diagrams or rate of pressure change-time diagrams can be obtained with these indicators. Detonation can be detected on the rate-of-pressure-change diagram by an easily observed elongation of the maximum height of the diagram, and a simple detonation indicator is formed by using the instrument without the transverse sweep of the cathode beam. In that case the diagram takes the form of a vertical line, say $\frac{1}{2}$ in. in length, which elongates to 6 in. or more according to the degree of detonation. Detonation can be detected by observing the rate of change diagrams of not only cylinder pressure, but also inlet-manifold pressure, crankshaft deflection, or even elongation of cylinder-head studs. In the case of the Dodds instrument, this latter diagram can be obtained by inserting a condenser consisting of mica and tin-foil sheets underneath the nut on one of the cylinder-head studs and connecting this to the unit, instead of the pressure element. Crankshaft deflection diagrams can be obtained by mounting a small insulated metal plate parallel to the engine flywheel, so that deflection of the crankshaft varies the air gap of the condenser formed by the flywheel and plate.—*Journal of the Institution of Automobile Engineers* for August and September.

Pierce-Arrow Property Purchased

The Braeco Realty Corp., controlled by the Brewster Aeronautical Corp., has purchased the former Pierce-Arrow property in Long Island City, which will be used for the manufacture of airplanes, airplane parts and equipment.

Canada Encourages Production of United States Subsidiaries

The Canadian government has passed an order-in-council designed to encourage automobile manufacturers, who formerly produced cars in Canada but discontinued after the Canada-United States trade agreement reduced the tariff against United States cars from 36 per cent to 17½ per cent, to resume Canadian production.

Automobile manufacturers producing less than 10,000 vehicles in Canada annually will be able to bring in certain spare parts from the United States free of duty if they can show the completed vehicle was 40 per cent Canadian content. The content requirement formerly was 50 per cent.

In order to make up to some extent for this loss of protection by Canadian companies, provision then was made that in the case of the large companies producing more than 10,000 vehicles a year in Canada, they could bring in certain parts from the United States free of duty, provided the finished car had 65 per cent Canadian content. For the companies with Canadian production under 10,000 cars annually, they were allowed to bring in parts free if their finished cars had 50 per cent Canadian content. The result was that the big companies were able to show a 65 per cent Canadian content and continued to run their Canadian plants, but the smaller companies found difficulty in showing that content and many ceased Canadian production, finding it more advantageous to manufacture the cars in the United States and pay the 17½ per cent duty.

To encourage these smaller companies to resume production in Canada, the Canadian content requirement has been reduced from 50 per cent to 40 per cent. The 65 per cent content in the case of the larger companies remains unchanged. The action was taken on recommendation of Revenue Minister Illsley, who is also Acting Finance Minister.

Horace C. Miller

Horace C. Miller, 58, assistant comptroller of the Firestone Tire & Rubber Co., of Akron, and president of the new Firestone subsidiary, the Firestone Latex Products Co., at Fall River, Mass., died Aug. 26 at the Akron, Ohio, city hospital. A graduate of Yale, Mr. Miller joined Firestone in 1919 as auditor. In 1932 he became assistant comptroller.

September 10, 1938

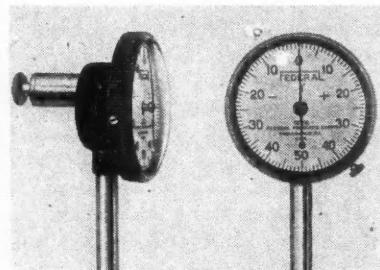


Indicator

. . . Federal instrument has crown gear instead of spiral for changing direction of gear movement.

Federal Products Corp., Providence, R. I., recently introduced an improved indicator which is called the V-8-I. The indicator is the perpendicular spindle type, e.g., the contact point is perpendicular to the face of the dial, which permits the indicator to be used in positions where the regular type of indicator is not readily adaptable.

One of the principal advantages of the indicator is the crown gear used in place of the spiral previously employed to change the direction of the



Federal Indicator

gear movement. According to the maker, this results in a much more sensitive and more accurate indicator.

The indicator also is equipped with an oilite bushing in the $\frac{3}{8}$ -in. diameter stems. This bushing, a new development of a self-lubricating bronze type, further aids in the elimination of friction.

Federal's V-8-I is graduated in

0.001 in. and has a total range of 0.100 in. It does not supersede the company's models "80" Jr. or F-8-I, as these will be manufactured for applications requiring a longer range than that of the new model.

Transmissions

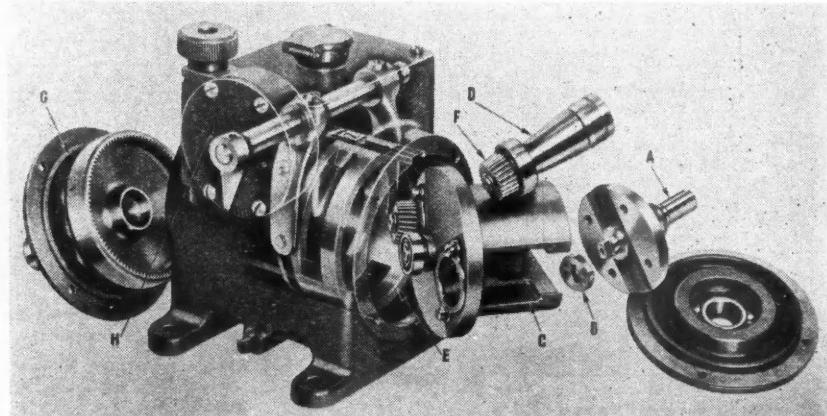
. . . New Models by Graham maintain full torque to zero speeds.

New model variable speed transmissions were announced recently by Graham Transmissions, Inc., Milwaukee.

By means of a device which automatically keeps the drive pressure in proportion to both the load and the speed, the Graham maintains full torque all the way to zero speeds. It transmits full motor power over a range of 4:1, and gives speeds in infinite steps from any desired maximum all the way to zero and reverse. Speed is adjustable, either stationary or running.

The Graham variable speed transmission is based on the principle of a ring of fixed diameter in contact with conical rollers, the speed ratio depending on the ratio of the diameter of the ring to the diameter of the rollers at the point of contact.

The photograph illustrates the essential elements in the drive. Two conical rollers (D) are carried in the carrier (C) spaced 180 deg. apart. The rollers bear under pressure against the contact ring (E) which surrounds the carrier. The position of E can be varied axially by means of the control wheel (H). The carrier (C) is attached to the drive or input shaft through the medium of



New Model Graham Transmission

the cam (B). The rollers (D) carry at their small ends pinions (F) which mesh with a ring gear (G) attached to the driven or output shaft.

In operation, as the shaft (A) is rotated the cam transmits this rotation to the carrier (C) and at the same time applies a pressure to the ring which automatically conforms to the requirement of both the speed and the load. This pressure between the rollers and the ring causes the rollers to rotate about their own axes, and in turn to drive the output shaft through the pinions and gear (F and G). The rate of the rotation of the rollers, and consequently the speed of the output shaft, depends on the position of the contact ring (E). The speed of the driven shaft is highest when the ring is in contact with the largest diameter of the rollers and lowest when it is in contact with the smallest diameter.

Strapping Tool

... Acme automatic device applies $\frac{5}{8}$ -in. and $\frac{3}{4}$ -in. steel strap.

A new automatic tool for quickly applying $\frac{5}{8}$ in. and $\frac{3}{4}$ in. steelstrap to heavy shipments including skid loads has just been developed by Acme Steel Co., Chicago.

Designed for easy operation, one lever tensions while the other seals the joint and cuts the strap from the coil without waste. Although of different design, this new tool, known as the Acme No. 2 Steelstrapper, is the companion to the No. 1, which is made to handle strapping in widths of $\frac{1}{4}$ in., $\frac{3}{8}$ in., and $\frac{1}{2}$ in.

Another advantage of the new Steelstrapper is the unlimited strap take-up for maximum tension.

A slide rule, designed to simplify the calculation of profit possibilities in equipment purchase, has been developed by a sales engineer of the Warner & Swasey Co., Cleveland manufacturer of turret lathes. Whether an investment in new equipment is justified generally depends on such factors as: cost, increased production, number of hours use per year, machine cost per hour, and useful length of life. Equipped with five scales, three of them movable, the new slide rule is said to facilitate rapid calculation of any one of the aforementioned factors when the others are known or can be approximated.

An illuminated magnifying glass of simple design is now manufac-

tured by Continental Machine Specialties, Inc., Minneapolis, for use on its Doall equipment or for use separately. When used on the combination sawing and filing machine the purpose of the glass is to provide additional illumination on close work and to "double the size of the layout line" on such work.

A compound wheel-truing attachment has been placed on the market by the U. S. Tool Co., Inc., East Orange, N. J. It is permanently mounted on the grinder spindle column.

Increase in Aircraft Production

The number of aircraft manufactured in the United States in the first half of 1938 was approximately 22 per cent greater than that for the same period last year, according to production figures made public by the Civil Aeronautics Authority. The total of all aircraft manufactured in the United States in the first six months of 1938 was 1974 as against 1623 for the same period in 1937.

While the total of all aircraft manufactured increased, there was a 21 per cent decline in the number produced for domestic civil use. The

greatest gain occurred in military production. This was 173 per cent. Export production increased 49 per cent.

Of the total of 1974 aircraft built during the first half of this year, 853 were for domestic civil use, 694 for the military services and the Coast Guard, and 427 for export. The 1623 total production for the first six months of 1937 was divided as follows: Domestic civil use, 1083; military and Coast Guard, 254; and export, 286.

Hupp Enters Low-Price Field

Four and six cylinder models in the low-priced car field have been added to the Hupp Motor Car Corp.'s line of products for 1939, it was announced by Norman de Vaux, general manager in charge of operations.

Entering a market long dominated by Chevrolet, Ford and Plymouth, the two small Hupp models will have the same chassis and be identical in appearance, said Mr. de Vaux, explaining that the four cylinder car will stress economy and the six will emphasize performance. Body design is to have a "touch of European styling," he declared.

Calendar of Coming Events

CONVENTIONS AND MEETINGS

National Petroleum Association Meeting, Atlantic City, N. J.	Sept. 11-16	New York, National Automobile Show, Nov. 11-18
American Foundrymen's Association Fall Technical Conference, Ann Arbor Sept. 15-17		Pittsburgh, Pa., Automobile Show, Nov. 11-18
Seventh International Management Congress, Washington Sept. 19-23		Detroit, Mich., Automobile Show, Nov. 11-19
National Lubricating Grease Institute, Annual Convention, Chicago .Oct. 3-4		Columbus, Ohio, Automobile Show, Nov. 12-18
SAE National Truck, Bus & Railcar Meeting, Chicago Oct. 4-5		Pittsburgh, N. Y., Automobile Show, Nov. 12-19
American Society of Mechanical Engineers Meeting, Providence....Oct. 5-7		Chicago, Ill., Automobile Show, Nov. 12-19
SAE National Regional Fuel and Lubricants Meeting, Tulsa, Okla....Oct. 6-7		Milwaukee, Wis., Automobile Show, Nov. 12-19
SAE National Aircraft Production Meeting, Los Angeles Oct. 13-15		Minneapolis, Minn., Automobile Show, Nov. 12-19
A.S.T.E. Annual Meeting, Pittsburgh. Oct. 14-15		*Philadelphia, Pa., Automobile Show, Nov. 12-19
National Metal Exposition, Detroit. Oct. 17-21		*San Francisco, Calif., Automobile Show, Nov. 12-19
American Welding Society Meeting, Detroit Oct. 17-21		Boston, Mass., Automobile Show, Nov. 12-19
SAE Annual Dinner, New York....Nov. 14		Los Angeles, Calif., Automobile Show, Nov. 12-20
SAE National Transportation Engineering Meeting, New York....Nov. 14-16		*St. Louis, Mo., Automobile Show, Nov. 12-20
National Safety Council Meeting, Chicago Nov. 14-18		*Elmira, N. Y., Automobile Show, Nov. 14-19
American Petroleum Institute Meeting, Chicago Nov. 14-18		New Haven, Conn., Automobile Show, Nov. 14-19
National Industrial Traffic League Meeting, New York Nov. 17-18		Indianapolis, Ind., Automobile Show, Nov. 19-25
Automotive Service Industries Show, Chicago Dec. 5-10		Baltimore, Md., Automobile Show, Nov. 19-26
National Standard Parts Association Meeting, Chicago Dec. 2-3		Rochester, N. Y., Automobile Show, Nov. 19-26
SAE Annual Meeting, Detroit....Jan. 9-13		Montreal, Canada, Automobile Show, Nov. 19-26

SHOWS

20th Annual National Metal Exposition, Detroit	Oct. 17-21	*Washington, D. C., Automobile Show, Nov. 19-26
New York, National Motor Truck Show, Nov. 11-17		*Cincinnati, Ohio, Automobile Show, Nov. 20-26

*Tentative

FIRST of the 1939 models to be announced is the new Plymouth, a car that is bigger than any of its predecessors, having a wheelbase of 114 in. (instead of 112 in.) and featuring a number of improvements affecting riding comfort, operating convenience, and safety. The new Plymouth has front independent suspension on coil springs of Amola steel. These are said to give a 20 per cent softer ride, which probably means that the static de-

flection of the springs is 20 per cent greater than in last year's model. The manifolding has been improved to increase the engine torque. Obstructions in the driver's compartment have been eliminated by providing a "remote-control" shift lever on the steering column. Steering has been improved as to steadiness, and the transmission is of new auto-mesh type design. An outstanding novelty is the safety-signal speedometer with automatic

signal lights which keep the driver informed at all times whether he is driving in the low, intermediate or high-speed range.

Styling of the Plymouth has been materially improved. A larger hood presents a sweep of painted surface extending 10 in. farther forward, as it curves down to the lower grille, and the new V-type windshield adds $6\frac{1}{4}$ in. to the body length above the belt. The overall length of the car is now 182 in. without bumpers. The grille now starts below the chromium-belt line that sweeps back from both sides of the hood. The name Plymouth, in metal script, appears on both sides of the shell, instead of centrally in front, the metal letters being joined by a speed line in casino red.

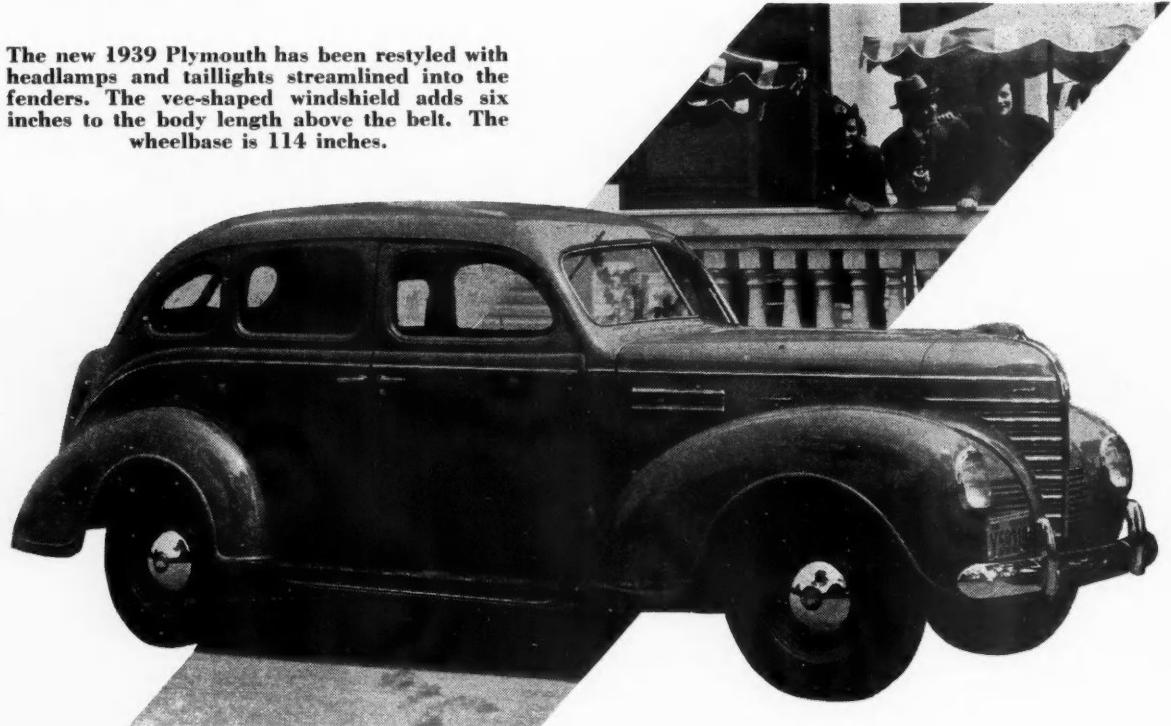
This year's grille introduces the "lateral airfoil motif." A pattern of chromium strips and parallel louvers in body color curve slightly



The remote control gear shift is on the steering post with the control linkage inside the column.

Plymouth for '39

The new 1939 Plymouth has been restyled with headlamps and taillights streamlined into the fenders. The vee-shaped windshield adds six inches to the body length above the belt. The wheelbase is 114 inches.

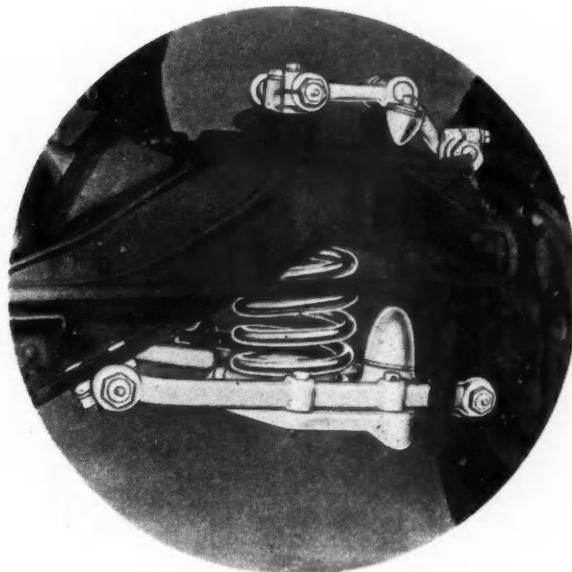


forward on each side of a bright center strip, then sweep back like an airplane fuselage to form the sides of the hood. Eleven chromium bars accent the contour of the grille louvers in a curved V pattern. At the narrow base of the "V," four louver sections and their chromium accents are repeated on each side.

The front fenders are deeper at the crown, and their nose extends farther forward, containing the new built-in headlamps, while the skirts sweep farther back. The front of the rear fenders also are deeper, there being additional metal toward the hub, so that the wheel apertures are smaller.

The headlamps are built into the forward sweeps of the front fenders and have oblong lenses. They are set off by ornamental bezels. Tail lamps also are built in, being streamlined into the extended rear-fender skirt. The hood, while big-

The new independent coil spring suspension is shown here with the "wishbone" control arms and the rubber bumpers at top and bottom.



the Plymouth ship still more streamlined, and its oval shape changes to a pennon outline all in chrome. Color accents on the exterior are casino red, with this color appear-

ment board and on the steering wheel. On the panel, which is finished in walnut grain like the garnish moldings around the windows, the bright color appears in two

Has Coil Spring Suspension

ger, is of the same type as before, with only the top panels hinged for service.

Hood louvers, which are located toward the rear of the side panels, repeat the horizontal airfoil motif of the grille. The louvers are accentuated by two parallel chromium strips above and below the vents.

The new radiator emblem shows

ing in a new ship silhouette on the bigger hub caps, on the two nameplate bars toward the front, on the bumper guards front and rear, and also as background for the new rear emblem, which again shows a four-masted ship in chrome.

The interior color scheme this year is in walnut brown, with color accents of casino red at the instru-

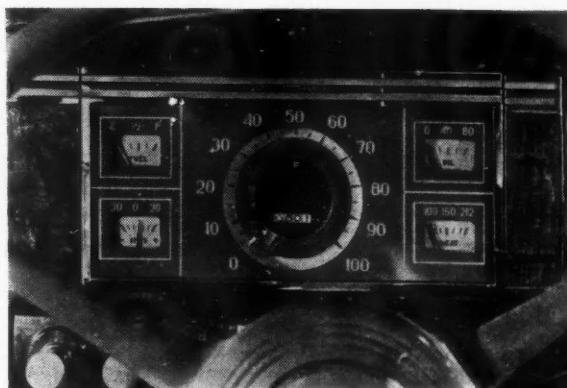
horizontal stripes across the top. On the wheel the color is at the hub and serves as background for another ship design.

The steering wheel this year has a flare at the top from which extends the gearshift lever, which is standard on all de luxe models. The control linkage is inside the steering column and the motion of the shift lever is concentric with that of the steering wheel. To take full advantage of the removal of the gearshift lever from the floor of the driver's compartment the brake lever has been moved to the left of the steering post, where it is mounted underneath the cowl.

Broadcloth and mohair upholstery remains optional. In de luxe models these upholstery fabrics now are tailored in a three-pillow design, button-tufted and trimmed with three horizontal "style" lines across the back and on the seats.

Insides of the new models abound in safety features. All inside door handles and window controls curve

(Turn to page 319, please)



Chrysler Engineers Develop a "Superfinish"

By JOSEPH GESCHELIN
THAT old saying—"Tis an ill wind that blows no good," may be aptly applied to a project recently completed by the machine shop production research staff of Chrysler Corp. Born of the travail of the service problem of "false brinelling" of wheel bearings some three years ago, a newly developed process called Superfinish bids fair to raise the quality level of machined surface finishes to the highest ceiling without appreciable increase in cost.

Without delving too far into the history of this development, it will be recalled that some years back many motor car producers were plagued with the problem of wheel roller bearings and ball bearings ruined beyond redemption in the trip by freight car from the factory to some distant point on the West Coast. This was soon recognized as "false brinelling" and became the subject of extensive study throughout the industry. Out of the study at Chrysler Corporation, came, eventually, a method of producing surface finish so free from scratches and surface imperfections as to resist wear and prohibit the localized stress concentration failure, which is responsible for "false brinelling."

Superfinish is described by David A. Wallace, President of Chrysler Sales Corp., a division of Chrysler Corp., who first conceived of such a method and has been directing all research, "as an extremely fine surface finish produced upon flat, internal, external, round, concave, convex and other types of surface by a combination of short motions, light abra-

sive pressures, slow abrasive cutting speeds, hard abrasive stones and a lubricant of proper viscosity, that eliminates the scratches and surface defects created by previous mechanical operations, without creating scratches or defects in the surface thus produced."

The process may be imposed as the finishing operation on practically any kind of work, fabricated from almost any kind of material, following any conventional method of material removal. On Chrysler passenger cars where the technique

has been most widely extended, it has been applied on the following parts: brake drums, brake linings, pistons, crankshaft pins and bearings, cam-shaft bearings and cams, flywheel faces, cylinder walls, valve stems, tappet head, wrist pins, etc.

Superfinish, then, is a process which produces rapidly and economically a well-nigh perfect surface finish, free of tool marks and scratches, save for a few random scratches seen only with the microscope, which are due to the presence of tool marks of more than average depth. There is no measureable change in the dimensions of the work-piece since the process is not one of metal removal but rather a means of removing the minute hills and valleys on the surface, resulting from the normal track of conventional metal cutting tools. In some cases, the process can be used for correcting or sizing dimensions; in all cases, it serves as an infallible quality control on previous operations by the tell-tale scratches that remain. This makes it possible to make subtle corrections in the preparatory operations, resulting in perfection within commercial limits.

Quality of the final finish as mea-

PART NAME	PREVIOUS OPERATION	MICRO-INCHES BEFORE	MICRO-INCHES AFTER
BRAKE DRUM	BORING WITH 0.22 FEED	110	11
CRANK SHAFT	ROUGH GROUND	50	6
PISTON	ROUGH GROUND	35	6
FLY WHEEL	ROUGH GROUND	33	10
CYLINDER BLOCK	REAMED	26	4
CAM SHAFT	FINISHED GROUND	16	4
VALVE STEM	FINISHED GROUND	14	5
TAPPET HEAD	FINISHED GROUND	6	2

Fig. 1—Profilometer readings of surface finish of various production parts, before and after Superfinish.

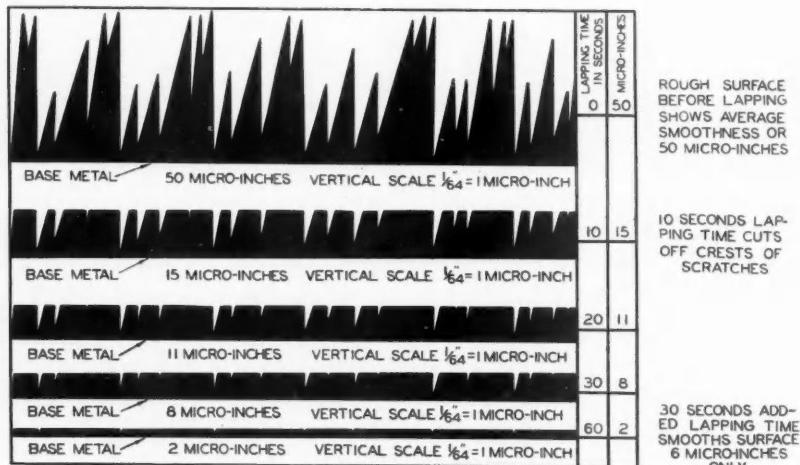


Fig. 2—Series of sketches showing development of progressively smoother surface by Superfinish. Starting with a relatively rough turned surface, each step indicates the improvement made by increasing the length of the finishing cycle. Readings of surface roughness are taken with the Profilometer.

"Superfinish"

sured by the degree of freedom from random scratches, as well as degree of polish, is readily controlled by just one element—time. Any degree of perfection can be attained by controlling the length of the finishing cycle, e.g., discs of stainless steel and even of cast iron have been polished to perfect reflecting surfaces when desired.

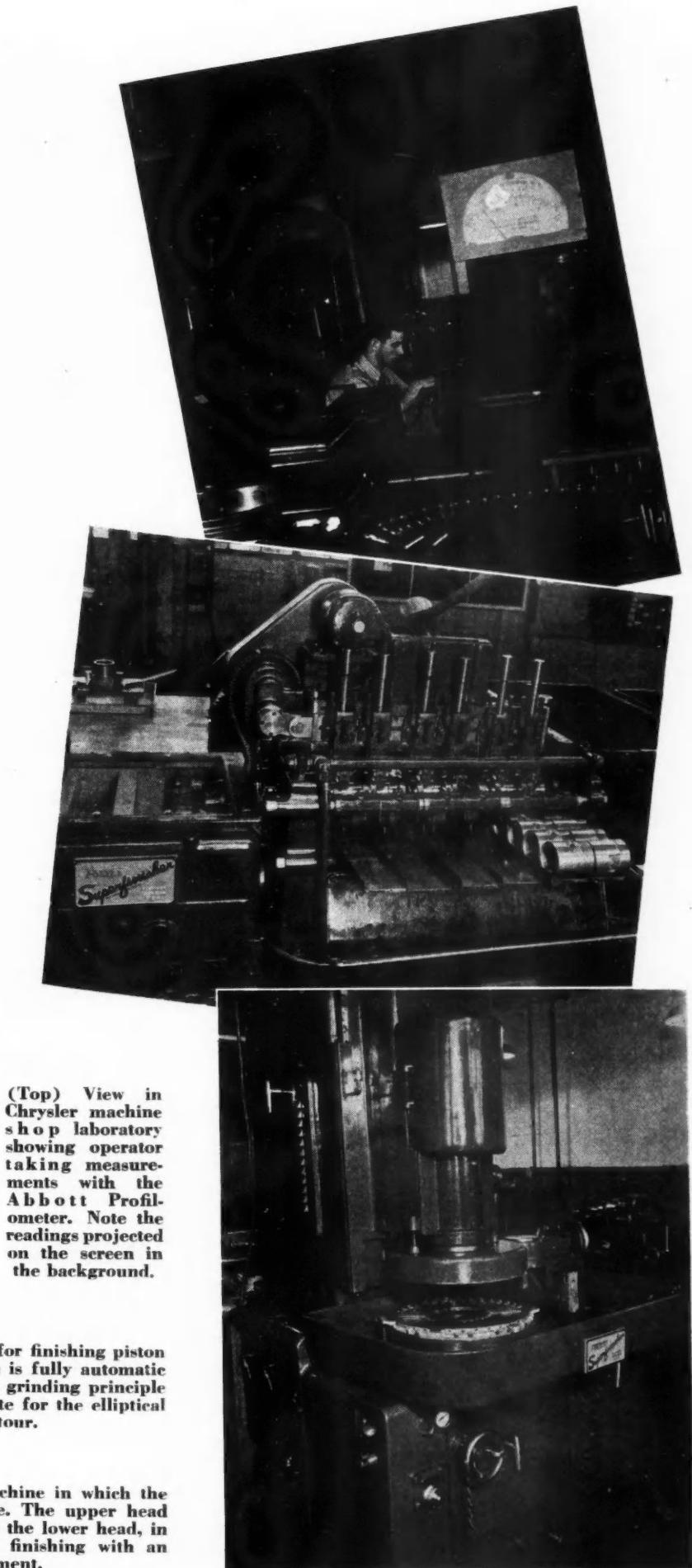
Patent applications covering all phases of the Superfinishing method, are pending. At the present time, the Foster Machine Co., Elkhart, Ind., is licensed to build the machines described and illustrated, but others may be similarly licensed in the future. The process is available to anyone in manufacturing industries who may be interested in its possibilities.

With this brief introduction, let us examine the general problem of metal removal process so as to have a better appreciation of the role of Superfinish. The principal methods of surface removal in conventional machine shop practice are:

- turning, with single-point tools
- grinding, with abrasive wheels
- honing, with abrasive stones
- lapping, with abrasive powders

The new Superfinish technique may be applied following any of these operations, and from the standpoint of manufacturing cost, it points to even lower cost levels through the elimination of more costly time-consuming finishing operations.

From a scientific viewpoint Chrysler production research engineers have shown that regardless of the method used for removing metal, and regardless of the type of tool used,



(Top) View in Chrysler machine shop laboratory showing operator taking measurements with the Abbott Profilometer. Note the readings projected on the screen in the background.

(Center)

Close-up of new production machine for finishing piston O.D. before anodizing. This machine is fully automatic in operation, embodying a centerless grinding principle of work actuation so as to compensate for the elliptical and tapered skirt contour.

(Right)

Valve stems are finished on this machine in which the valves are held in a circular fixture. The upper head produces rotation of the work, while the lower head, in the base below the work, does the finishing with an oscillating stone movement.

there is a characteristic pattern of surface imperfection. The difference in coarseness of the surface produced by various methods is found to be the resultant of the pitch of the scratches—the measurable distance from crest to crest of tool marks—the pitch being coarse for single-point turning and extremely fine in honing or lapping, where there are a multiplicity of fine cutting points.

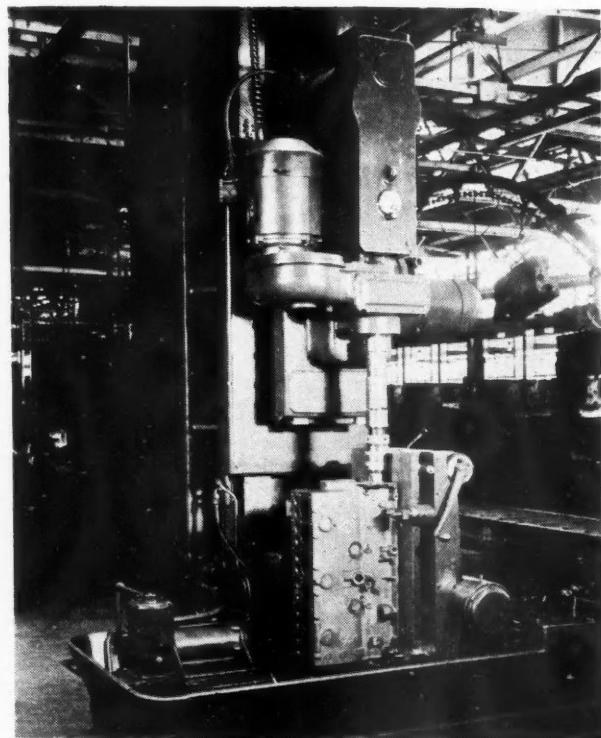
The most logical explanation for these phenomena, according to Chrysler production engineers, is that in all metal removal and surface finishing operations which have been used previously to the introduction of Superfinishing, there is a similarity of certain conditions:

- (1) the work has to be revolved or moved at high speeds simultaneously with—
- (2) a correspondingly high feed of the tool and—
- (3) relatively heavy depth of cut.

No matter how these functions are adjusted in practice, the combinations of speed and pressure required for metal removal generate heat and elevate the skin temperature of the metal being cut. The rise in temperature, oftentimes between 600 and 700 deg. Fahr., and sometimes even higher, produces surface ductility of the skin, particularly at the cutting area, thus making it susceptible to surface scratches.

As distinguished from all known methods of finishing, Superfinish encompasses an entirely novel technique. Rubbing speed is very low as compared with any other method; pressures range from a few ounces to a maximum of only a few pounds as compared with pressures from 20 to 100 pounds for ground and honed finishes.

Superfinish is being applied to the finishing of main bearing bores on this set-up. The massive bar carries a series of stones which operate with a combination of rotating and oscillating movement in the work.



The cutting fluid plays a most important role in the process. It has two functions—to wash away the cuttings, and to control the degree of surface finish. It serves essentially the function of a lubricant.

This indeed is a unique property. Consider that the cutting fluid constitutes a film separating the stone and the work surface. The pressure on the stones is balanced against the film strength of the cutting fluid so sensitively that as the surface approaches smoothness and is completely coated by the film, the stone cannot cut through to touch the metal surface. Evidently the mechanism

of the process is about as follows—at the beginning of the operation the fluid fills the valley of the scratches and permits contact between the stone and the projecting roughnesses on the surface; as the roughness is progressively removed, the fluid film becomes more uniform on the surface until most of the roughness is gone; then as the surface approaches the desired degree of smoothness, the film strength balances the force on the stones and prevents actual contact. Thus the viscosity of the fluid constitutes a positive control and assures a well-nigh perfect finish by preventing actual contact between the stones and the work surface.

In the design of the equipment for producing Superfinish, it is necessary to provide at least three motions between the stone and the work; five or more are desirable. In fact, some equipment has been developed with as many as ten motions simultaneously.

Despite the microscopic perfection of the surface produced by the Superfinish process, it is measured accurately by means of modern scientific instruments. It may be checked with optical flats, or viewed visually with the microscopic comparator, or photographically by means of microphotographs, or measured quantitatively with the Profilometer. This instrument, developed by Dr. E. J. Abbot, is familiar to readers of AUTOMO-

(Turn to page 332, please)

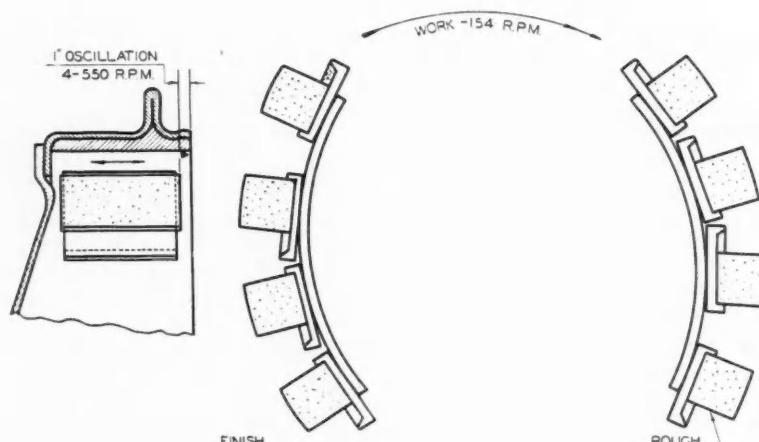


Fig. 3—Detail of relatively intricate tool holder set-up for finishing brake drum controlled surface. Stone holders permit oscillation of stones as indicated.

Plymouth for '39 Has Coil Spring Suspension

(Continued from page 315)

back. The back of the front seat is thickly padded and rolled at the top. Windshield wiper buttons are of a soft sponge rubber, the same material that is used for the arm rests. For safer operation of clutch and brake pedals (to prevent slipping of the foot), there is a toe recess in the dash. The reading light is over the back window, behind the passengers.

All interior hardware is of new design this year. It shows a wider use of plastics. The new instrument board contains three separate die-cast units: One for the instrument group; one for the center radio assembly, with built-in loud-speaker grille, and one for the glove-box door. The center of the board is a grille design, with provision for a row of automatic station-selector buttons to be recessed into the panel. A corresponding narrow panel on the other side of the grille will accommodate a vertical dial when the radio is installed.

All instruments and controls are centered directly in front of the driver, the group being dominated by the "safety-signal" speedometer. All illumination of the dial is indirect, except for a light on the indicator needle which changes from green to amber at 30 m.p.h., remains amber up to 50 m.p.h., and changes to red when this speed is exceeded.

The ash tray for the front compartment is conveniently located in the center of the rounded top panel above the board. In four-door sedans another ash tray is now built into the back of the rear seat. Other refinements include a rain trap on the cowl ventilator of the deluxe model, and improved defrosting vents built into both halves of the new V-type windshield at the base.

Front-seat adjustment now has a range of 5 in., and the seat moves on inclined runners so that it rises as it moves forward, thus automatically assuring the proper eye level for drivers of different heights.

The frame of the 1939 model has 6-in. side rails with 1½-in. flanges, which together with a new center X member 10 in. deep have increased the frame rigidity 25 per

cent. Engine supports at both front and rear have been stiffened.

Independent suspension on coil springs of Amola steel is used at the front of the chassis, the steering heads being guided by a wishbone linkage. Each spring is wound from a steel rod 11 ft. long. Power-plant improvements include a new type of piston ring with specially treated surface which is said to reduce the wearing-in time. Both of the compression rings are of this type, and the top ring is said to have 25 per cent more bearing surface and correspondingly less specific pressure. Exhaust valves are of a new silicon-chromium steel. The carburetor now has 10 per cent more flow capacity and is provided with a balancing tube, the float bowl being vented into the air cleaner, which prevents changes in the mixture ratio when the air cleaner becomes clogged. The inverted fuel pump gives greater protection against vapor lock.

With the new independent front suspension, center steering is used, and the conventional drag link is eliminated. The steering gear ratio has been brought back to its former high ratio of 18.2, to facilitate maneuvering in parking. A new all-silent transmission is standard on the 1939 Plymouth. All gears are of case-hardened Amola steel and are automatically synchronized. Through the use of an "over-center" spring and variable pedal

ratio, the pressure required to operate the clutch has been decreased. Clutch ventilation has been improved by increasing the size of the ventilation openings, and the clutch housing has been stiffened by ribbing.

Wheel-cylinder connections of the hydraulic brakes have been simplified, and the flexible tubing at the wheels has been shortened to reduce the pedal travel required. A new brake-lining material with a friction coefficient 10 per cent higher reduces the pedal pressure required to apply the brakes.

The Plymouth for 1939 retains those features that have long been characteristic of this make, including floating-power engine mounting, low-pressure shock absorbers, rubber body mountings and sound-proofing. A new insulating material has been added this year—consisting of whipped-up cellulose allowed to solidify while still in the foaming stage, which is applied in an inch-thick blanket to the dash panel inside the car.

All sheet-metal parts are rust-proofed. Standard colors for 1939 include silver-wing gray, gun metal, pottery blue, aviator blue, amphibian green, Hampton beige and black. The 1939 Plymouth line includes five Road King and eight de luxe body types, all mounted on a chassis of 114-in. wheelbase and equipped with the same 82-hp. engine.

Measurement of Platings

A NON-DESTRUCTIVE magnetic method for measuring the thickness of non-magnetic coatings on iron and steel is described by Abner Brenner in Research Paper RP1081 of the National Bureau of Standards (obtainable from the Superintendent of Documents, Washington, D. C., for 5 cents). The instrument used is similar to that previously described for measuring nickel coatings on non-magnetic base metals. The present method depends on the decrease in the attraction of a permanent magnet for steel when the two are

separated by a non-magnetic coating. Measurements on commercial coatings of which the actual thicknesses were determined by standard methods yielded results which were accurate to ± 10 per cent for most coatings. The results were about 25 per cent low for hot-dipped tin coatings, which are only about 0.0001 in. thick. Because nickel is less magnetic than steel, the thickness of nickel coatings on steel can be measured satisfactorily by this method, a suitable calibration curve being used.

Cost of Gasoline and Fuel Tax in Europe Promotes

New Developments

By P. M. HELDT

AUTOMOTIVE-TYPE Diesel engines at present are being used much more extensively in European countries than in the United States, in proportion to the total horse powers used in transportation in the various countries. This is undoubtedly due to the much higher fuel cost and the consequent greater differential between carburetor and Diesel fuels in European countries. Up to the present at least, the Diesel engine has been considerably higher in first cost, and the saving on fuel cost which may reasonably be figured with during the life of the engine must warrant the additional first cost. With fuel prices what they are in European countries, the purchase of Diesel-powered equipment is evidently justified in the case of trucks of more than 2 or 2½ tons capacity, and of large buses, for such vehicles now are powered with Diesel engines almost exclusively. In most European countries Diesel fuel is taxed at the same rate per unit of volume as fuel for carburetor engines, and a uniform increase in the tax on all motor fuels, like that which occurred in England recently, further increases the differential between carburetor and

Diesel fuels and adds to the advantage of the Diesel.

The acceptance met with by the automotive Diesel in the heavy-truck field naturally encouraged European Diesel manufacturers to extend their

order to bring down the specific weights. A considerable number of engines are now being produced in European countries with a specific weight of less than 15 lbs. per horse power, but some of the manufac-

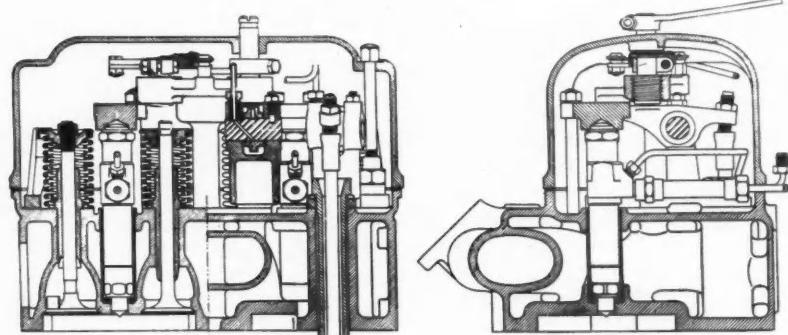


Fig. 1—Cylinder head of Dorman Diesel engine

markets by setting out to develop engines suitable for use in passenger cars, as well as in light trucks. This, of course, called for considerably higher rotary speeds than are customary in large truck engines, in

turners do not recommend them for use in passenger cars, realizing that their roughness in operation and their lesser flexibility as compared with the carburetor engine would prove a serious handicap in that field. The manufacturers who recommend their engines for passenger-car service or who build passenger cars equipped with them, have received particular encouragement from operators of taxicabs. It is quite obvious that in countries where gasoline costs from three to five times as much as it does here, the fuel cost is a very important item in the operation of a taxi service, and any prospects of cutting it to one-third or less naturally draws the attention of such operators.

The accompanying table gives the principal specifications of Diesel en-

Diesel Passenger-Car Engines

Make	Cyl. No., Bore and Stroke	Displ.	Hp. and Speed	Spec. Weight
Citroen	4-2.95 by 3.94	107.7	40 at 2500	11.1
Hanomag	3-3.14 by 3.74	115.9	32 at 3000	...
Junkers	4-3.30 by 9.45	332.3	120 at 1500	13.7
Mercedes	4-3.54 by 3.94	155	45 at 2800	15.5
Saurer	4-3.13 by 4.73	147	43 at 2500	13.7
Saurer	4-3.34 by 4.93	173	50 at 2500	12.3
Saurer	6-3.13 by 4.73	221	75 at 3000	9.8
Saurer	6-3.34 by 4.93	260	88 at 3000	8.6

Part One

*Part Two will conclude
this article in an early
issue of AUTOMOTIVE INDUSTRIES*

S in High Speed Diesels

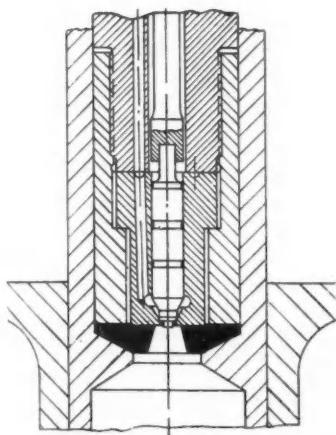


Fig. 2—Mercedes method of protecting nozzle tips against excessive temperatures

gines that are actually being fitted into stock passenger cars or are recommended for the purpose by their makers. It is not claimed that this covers all of the models available for such use.

In their enthusiasm over the success of the Diesel in the heavy-truck field, a number of German manufacturers about two years ago came to the conclusion that it was destined to rule the light-truck field as well, and discontinued the manufacture of gasoline-engined trucks of 1-ton capacity or thereabouts. However, since the difference in the cost of gasoline and Diesel engines is dependent mainly on the cost of the injection equipment, which does not change materially with size, the increased first cost of the Diesel was a much greater handicap in this field, and severe competition from quantity producers of light gasoline trucks made necessary a return to

that type on the part of makers who had abandoned it.

A good general idea of what Europe offers in the way of automotive type Diesel engines can be obtained from a table of specifications published in *AUTOMOTIVE INDUSTRIES* of May 28, 1938. None of the British engines there listed are recommended for passenger-car installation. The highest speed of the British engines is 2500 r.p.m. The majority of the engines designed for truck and bus use have rated speeds ranging between 1500 and 2500 r.p.m. Horse powers per cu. in., of course, vary widely with the speeds of revolution. Of the British Diesel engines listed, one has a specific output of 0.269 hp. per cu. in., and in eleven the specific output is over 0.20 hp. per cu. in., but the average for all engines listed is only 0.164. The maximum combustion pressures of all British engines average 790 lb. per sq. in. These engines have an average compression ratio of 15.9, or nearly 16. The average weight per horse power is 29 lb. Disregarding a few engines with a b.m.e.p. of more than 120 lb. per sq. in., which are evidently supercharged, the average

b.m.e.p. of the British engines at the speed of maximum output is 85 lb. per sq. in.

Of 176 European automotive Diesel engines for which specifications were published in *AUTOMOTIVE INDUSTRIES*, 55 have direct injection, 53 pre-combustion chambers, 49 turbulence chambers, and 19 air chambers. The turbulence-chamber type predominates in England, the pre-combustion-chamber type in Germany. Of course, the demarkation between the different types is not a very sharp one. For instance, the Saurer engines have a turbulence chamber in the piston, which forms practically the whole of the compression chamber and is wide open to the cylinder. As in this case the fuel is injected through the upper part of the cylinder into the turbulence chamber, these are classed as direct-injection engines.

Practically all engines work on the four-stroke cycle, the only prominent exception being the Junkers. However, the two-stroke is in the ascendency, especially in the aircraft-engine field, much of the development work now under way on aircraft Diesels being on two-stroke designs.

Fig. 3—Remote control for railcar Diesel engines (British Electric Co.)

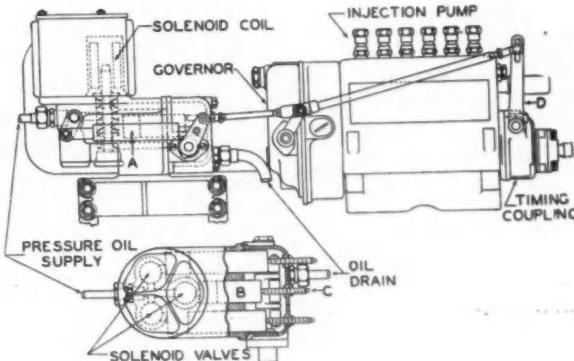
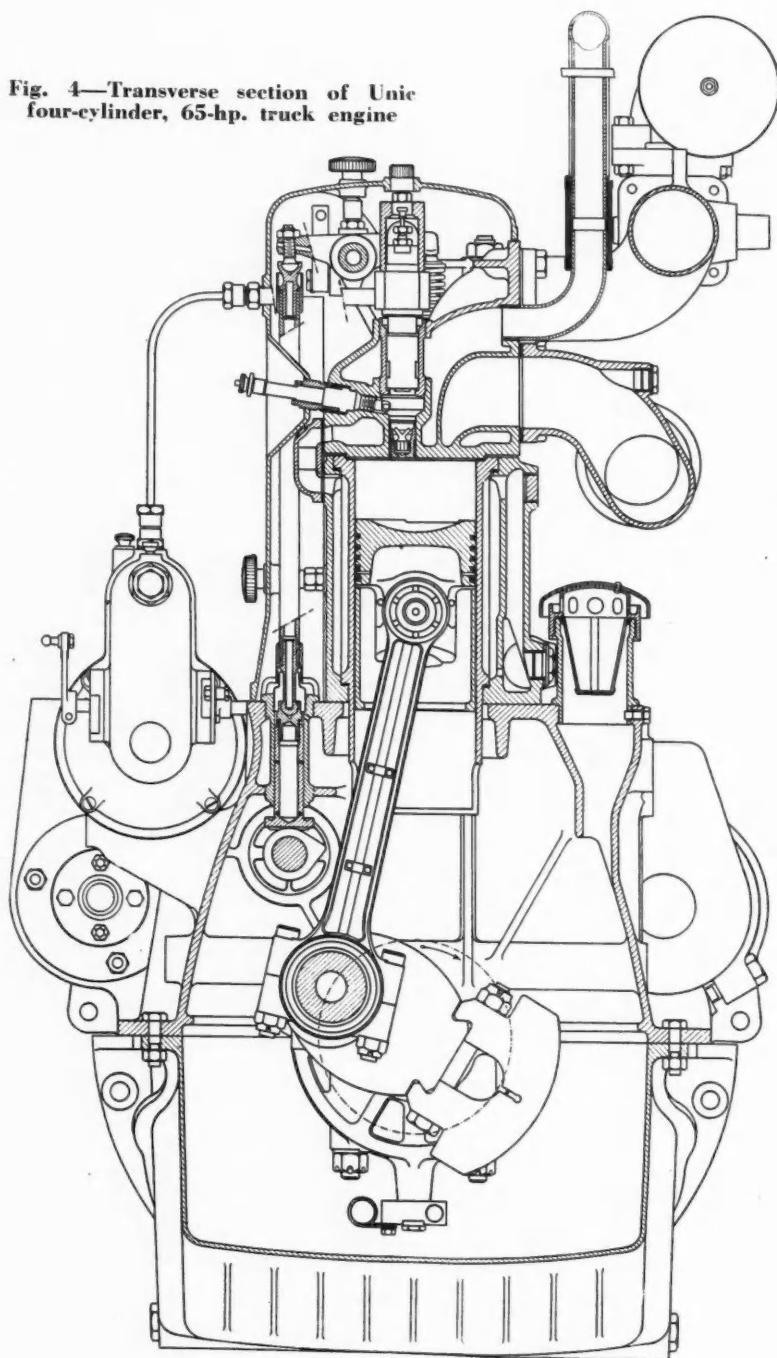


Fig. 4—Transverse section of Unic four-cylinder, 65-hp. truck engine



Besides the Junkers Works, Krupp in Germany and C.L.M. in France manufacture Junkers-type two-stroke engines. The only other two-stroke high-speed Diesel engines in production in Europe, so far as I know, are the Petters in England, a marine engine, the Burmeister & Wain in Denmark, which is used principally for railcars, and the Jung in Germany. All except the last one use a separate blower for scavenging, while the Jung uses the crankcase

as a scavenging pump chamber. The old-established firm of Burmeister & Wain has recently organized a subsidiary to manufacture automotive Diesels of the two-stroke type.

A typical British engine of recent design is the Dorman, of which sectional views of the cylinder head are shown in Fig. 1. This, it will be seen, is a direct-injection engine, the injection nozzle being located in the cylinder axis between the inlet and exhaust valves. It will be noticed

that the inlet valve is "masked" to produce a swirling motion of the air as it enters the cylinder. An interesting feature is the mounting of the injector valve, in a shell passing through the water jacket. This shell presumably consists of copper and serves to carry the heat absorbed by the inner end of the injector nozzle to the cooling water. This particular engine is fitted with dry cylinder liners. It has a bore of 4.53-in., a stroke of 5.12-in. (329 cu. in.), and develops a maximum of 69 hp. at 1800 r.p.m., but for continuous operation the manufacturer sets a speed limit of 1250 r.p.m., at which speed it develops about 50 hp. It would seem that the deflectors on the inlet valves and the wide spacing of the valves to make room for the injector, must limit the breathing capacity rather severely.

In order to assure long life of injection nozzles in high-speed engines, their tips must be protected against excessive temperatures. Certain manufacturers for quite a number of years past have inserted the nozzle into a sleeve extending through the water jacket and in direct contact with water all around, as in the Dorman engine just described. Where a considerable length of sleeve is surrounded by water there is undoubtedly a very effective cooling action, even though the circumference of the nozzle does not actually contact the sleeve. This method of cooling, however, is hardly applicable where the nozzle injects into a precombustion chamber or into a turbulence chamber.

Fig. 2 shows a method heat-protection for the nozzle which has been developed by the Daimler-Benz Company. The object was to prevent all direct heating of the injector body. This made it necessary to shield both the end surface of the injector and also the annular space between the nozzle proper and the cap nut. This is accomplished by means of a soft-copper washer. In order to obtain a dependable seal, the nozzle is machined so it projects about 0.004-in. from the cap nut. When the nozzle is fastened down, the copper washer deforms plastically until the cap nut seats firmly on the copper. The injector body is then almost completely protected against direct heating. Thermocouple measurements are said to have shown that the face of the injector in contact with the copper washer under conditions of full load reached a maximum temperature of only 375 deg. Fahr., whereas the metal immediately below the washer reached a temperature of 1100 deg. Fahr.

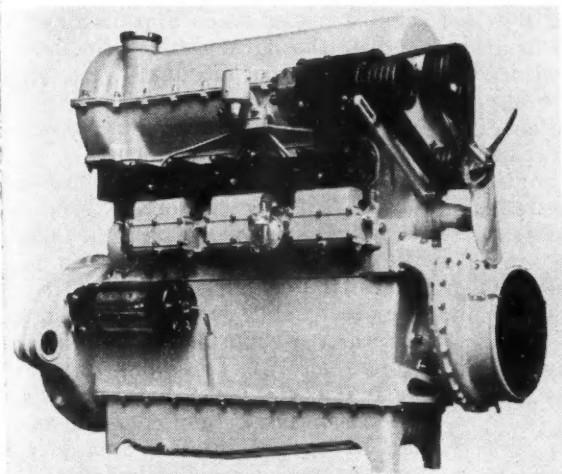


Fig. 5—CIM six-cylinder, two-stroke, double-piston railcar engine of 150 hp.

The English Electric Co. builds Diesel engines for use on railcars and for stationary duty, of comparatively large output and moderate speed. A recent addition to the line is a six-cylinder engine with a maximum rating of 220 hp. It has a bore of 6 in. and a stroke of 8 in., and dual valves are used, all valves being in the cylinder head. With four valves in the cylinder head it is quite convenient to locate the injector in the axis of the cylinder. In addition to the four valves and the injector, there is a relief valve in the head. Most of the compression space is in the top of the piston, which latter has a rim that comes down close to the under side of the cylinder head at the end of the up-stroke. This, together with the fact that there is a sort of cone at the center of the chamber in the piston, produces a strongly turbulent flow in the combustion chamber toward the end of the up-stroke. The engine has a 1-hr. rating of 220 hp. at 1500 r.p.m. and a 12-hr. rating of 200 hp. at the same speed. The maximum b.m.e.p. corresponding to the 1-hr. rating is 95 lb. per sq. in., and that corresponding to the 12-hr. rating, 86 lb. per sq. in.

An interesting feature of this engine is a remote-control device by means of which the governor can be made to hold the engine within any one of three different speed ranges. It comprises a hydraulic relay actuated by the pressure on the oil in the engine lubricating system. In this relay (Fig. 3) there are three parallel cylinders whose axes are at the corners of an equilateral triangle. The pistons in these cylinders

can press against crank arms on a horizontal shaft extending through the housing of the relay, which outside the housing carries a lever arm from which there is link connection to an arm on the governor shaft on the injection pump. Mounted at the forward end of the engine is a group of three solenoids, which actuate piston valves below them. These valves control the flow of oil from the engine lubricating system, admitting the oil to one or another of the three cylinders, and at the same time opening the other two cylinders so that oil can escape from them. In the

drawing, *A* designates the enclosed return spring that brings the governor lever to the "Stop" position when all three solenoids are de-energized. *B* is the piston that controls the lowest speed range, and *C* the adjustable stop for this piston. *D* is the lever arm of the injection-timing device. In the lower of the two drawings the piston in the upper cylinder is shown in contact with its crank arm, and the control, therefore, is set to operate in the highest speed range. Each speed range can be readily changed by means of the set screw in the crank arm. When it is desired to change from one speed range to another, the solenoid switch is moved accordingly. Oil can then escape from the cylinder which has been under pressure and oil under pressure is admitted to the cylinder corresponding to the speed range selected. The three ranges provided in railcar installations normally have upper limits (engine idling) of 580, 900, and 1350 r.p.m.

Practically all French manufacturers of automotive-type Diesel engines operate under foreign licenses. Thus, Bernard, Latil, and Delahaye operate under Gardner license, Rochet-Schneider and Peugeot under Oberhansli license, C.L.M. under Junkers license, and Renault, Berliet and Citroen under Ricardo license. The Unic Automobile Company manufactures a pre-chamber-type Diesel, of which a sectional view is shown in Fig. 4, the combustion-chamber arrangement is very similar to that of the Mercedes. The engine illus-

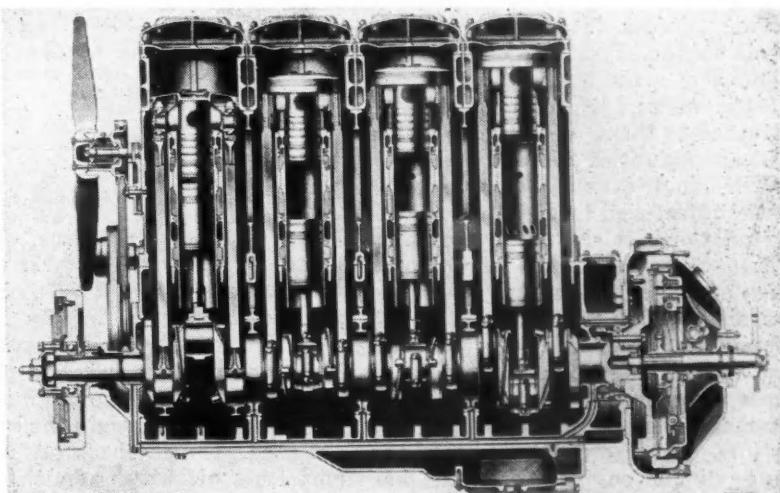


Fig. 6—Single-crank Junkers-type engine manufactured by Krupp

trated is a four-cylinder of 4.33-in. bore by 5.12-in. stroke (298 cu. in.), and develops 65 hp. at 2000 r.p.m. The cylinder heads are cast in pairs. Wet liners are provided in the engine block. The crankshaft has only three main bearings, which is rather unusual for Diesel engines. Its bearing surfaces are hardened by the Double-Duro process. Pistons are of the Bohnalite type, and the injection equipment is Lavalette-Bosch. Cold starting is facilitated by glow plugs which enter the precombustion chambers from the side. The starting battery consists of four groups of cells of 6 volts and 120 amp.-hrs. each. An oil filter is mounted on the lower half of the crankcase, as plainly shown in the drawing.

Compagnie Lilloise de Motours of Lille manufactures two-stroke engines of the general type of Junkers, but with upper and lower crankshafts, which are connected by spur gearing. A centrifugal single-stage blower is used for scavenging and supercharging. The automotive (motor truck) engine has a bore of 2.36 in. and a combined stroke of 5.90 in. As a four-cylinder it is said to develop 60, and as a six-cylinder, 90 hp. at 3000 r.p.m. The specific weight of the six-cylinder model with flywheel and complete electrical equipment is given as 7.7 lb. per hp., which is unusually low. Of course, light alloy castings are used for all structural parts. The photograph reproduced herewith shows a larger engine, the 6 DV 85, a six-cylinder of the 3.34-in. bore and 8.26-in. combined stroke, which develops 150 hp. at 2100 r.p.m., weighs 1433 lb., and is used mainly for railcar service. When two crankshafts are used, the strokes of the two pistons are made alike, whereas in the single-crankshaft engine, the stroke of the upper pistons is made shorter, on account of the extra reciprocating weights attached to them. C.I.M. also makes railcar engines of 250 and 500 hp.

The single-crank Junkers engine, as manufactured by Krupp for truck installations, is shown in section in Fig. 6. Here the pistons in the upper ends of the cylinders are secured to scavenger-pump pistons of much larger diameter, and long connecting rods extend from both sides of these combined upper pistons to the crankshaft in the crankcase at the bottom. The crankshaft for the four-cylinder engine, therefore, has twelve throws, and it stands to reason that with the twelve pistons attached to it the crankshaft assembly must have a rather low frequency of natural vibration. To avoid trouble from torsional vibra-

tion, a torsion damper is mounted on the forward end of the crankshaft. It consists of a small flywheel mounted on a radial ball bearing. Two steel disks are bolted to the forward side of the flywheel, and these intermesh with similar disks rigidly secured to the crankshaft, the two sets of disks being connected together by layers of vulcanized rubber between them. The new feature, it would seem, is the use of separate ball bearing for the damper, which usually is supported solely by its rubber damping elements.

While on the subject of two-stroke engines, a brief description may be

the latter taking place through ports uncovered by the small end of the double piston when approaching the end of the down stroke. No dimensional and output data were given in my source, only consumption curves, which are similar to those from other Diesel engines.

The Krupp Works also build another entirely different type of Diesel engine for use on light trucks. As illustrated in Fig. 8, this is a four-cylinder air-cooled engine of the prechamber-type. Up to recently, at least, Krupp built the Junkers engine also in two- and three-cylinder models, and there are some interesting bases for comparison in the Krupp specification tables of a year or two ago. For instance, the four-cylinder four-stroke and the three-cylinder two-stroke had exactly the same displacement of 249 cu. in.; the former had an output of 50 hp. at 2200 r.p.m., the latter of 85 hp. at 1500 r.p.m. The maximum b.m.e.p. was 87 lb. per sq. in. in the four-stroke engine and 105 lb. per sq. in. in the two-stroke engine, which, of course, was made possible by supercharging. As a piston-type supercharger is used, it is perhaps not a fair comparison. The specific fuel consumption is 0.49 lb. per hp.-hr. in the case of the four-stroke, and 0.44 lb. per hp.-hr. in the case of the two-stroke. This difference, however, is probably due more to the difference in the combustion processes than to that in the engine cycles, as the four-stroke engine is of the prechamber type, which admittedly is somewhat less efficient than the direct-injection type, to which the two-stroke Krupp Junkers belongs. The difference in the combustion processes also explains the difference in the maximum pressures of 710 and 1000 lb. per sq. in. in the prechamber and the direct-injection engine, respectively. But while the two-stroke engine develops 70 per cent more power per unit of displacement than the four-stroke, its advantage on the specific-weight basis is much smaller, the figures being 18 $\frac{1}{4}$ and 20 lb. per horse power for the two-stroke and four-stroke, respectively. Both of the Krupp engines have intermediate bearings of such diameter that the crankshaft can be withdrawn through them endwise. Experiments with such bearings in carburetor engines in this country have shown that they materially increase the starting torque in cold weather, but this probably is a less serious matter in the case of Diesel engines, whose starting torque is much greater in any case.

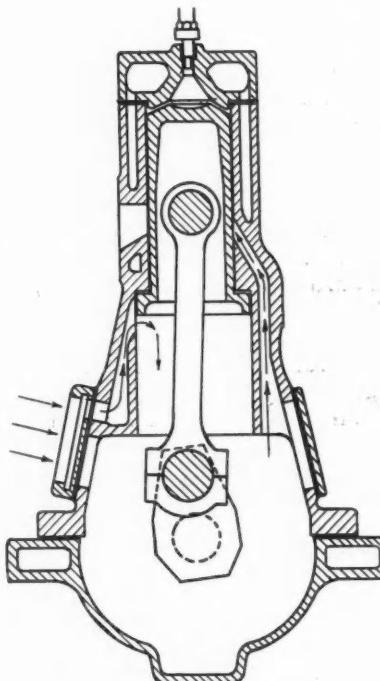


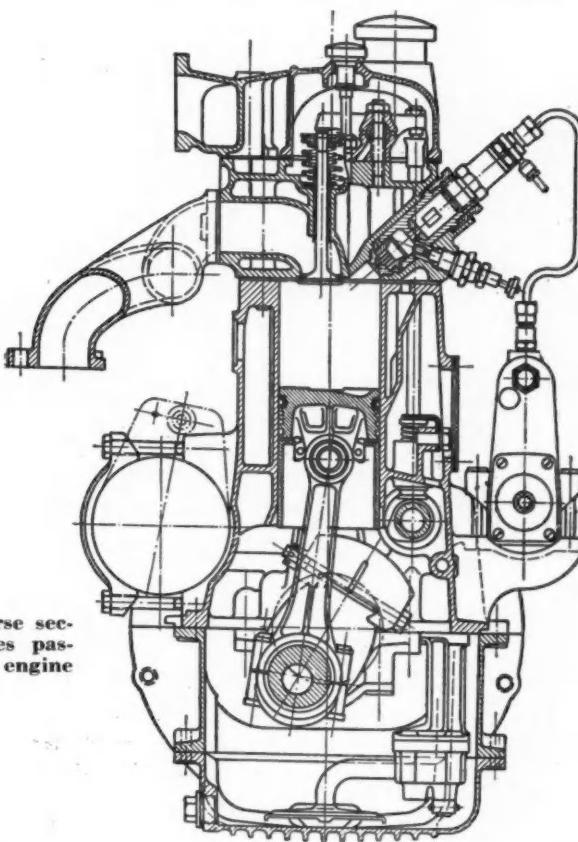
Fig. 7—Section of Jung two-stroke engine with crankcase scavenging.

given of the Jung engine, of which some details have appeared in a German export paper. This engine, as shown in section in Fig. 7, works with crankcase precompression, and in order to obtain sufficient pumping capacity to ensure thorough scavenging, stepped cylinders and pistons are used. The engine is of the three-port type, air being admitted to the crankcase through a port uncovered by the large-diameter part of the double piston when approaching the end of the up-stroke, the transfer of charge from crankcase to cylinder and exhaust of the burnt gases from

Daimler-Benz in Germany produces a small Diesel engine for passenger cars, taxicabs, light delivery wagons and the like. It is a four-cylinder design of the familiar Mercedes prechamber type, and a cross-section of it is shown in Fig. 9. The prechamber unit is set into the cylinder head at an angle of 47 deg. Cylinder dimensions are 3.54-in. bore by 3.94-in. stroke, and the engine is rated 45 hp. at 2800 r.p.m. The combustion pressure is said not to exceed 700 lb. per sq. in., and the injection pressure is only 1250 lb. per sq. in. These two features, viz., low injection pressure and low combustion pressure, are the two outstanding characteristics of the prechamber engine. The low combustion pressure is due to the fact that before the fuel is introduced into the cylinder, it is raised to the ignition temperature in the prechamber, so in the main combustion chamber it burns as it is introduced, that is, gradually. In the prechamber the combustion pressure is of the same order as that in the main chamber in a direct-injection engine, but as the prechamber is a small, practically closed vessel, a high pressure in it can do no harm. The specific fuel consumption claimed for the small Mercedes Diesel is 0.44-0.45. lb. per hp.-hr. The weight of the complete engine is slightly over 700 lb.

Like other prechamber engines, this one requires special starting aids for starting from cold. Orig-

Fig. 9—Transverse section of Mercedes passenger car Diesel engine



inally an electric heating element was used in the air inlet, but at present use is made of a special

vapor-type starter which was developed by the Robert Bosch Company, and of which an assembly view is shown in Fig. 10. It is well known that there is always some leakage past the valve stems of closed injectors, and this leakage fuel is usually drained off to the main tank by special return tubes or drain tubes leading from the injectors. In the Mercedes engine the leakage from the injector in the rear cylinder is led to a small container supported by an aluminum casting flanged to the inlet manifold. A tube that is closed at its lower end depends from the bottom of the container. The container is provided with a cover plate in which there is a small overflow pipe that discharges directly into the inlet manifold. This takes care of the excess fuel if the leakage should be more than is required for starting.

Centrally within the tube depending from the container is a small-bore heater tube. Fuel enters this tube through a small opening at its lower end and rises in it to the level in the container. At its upper end within the aluminum casting the heater tube is looped and provided with a nozzle through which it dis-

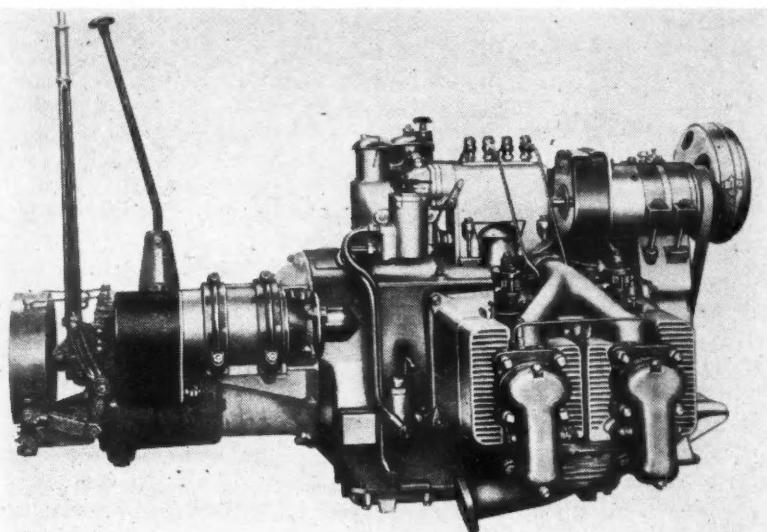


Fig. 8—Krupp four-cylinder air-cooled prechamber-type truck engine

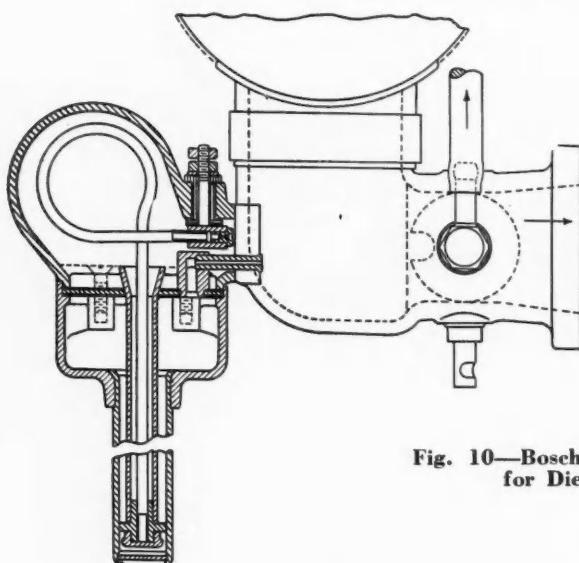


Fig. 10—Bosch vapor-type starter for Diesel engines

charges into the inlet manifold. The upper end of the heater tube is insulated and has an electrical binding post secured to it. When the engine is to be started, a switch is closed, which sends a heavy current through the length of the heater tube, heating it and the fuel contained by it.

In order that the heat thus generated may be confined where it will do the most good, the heater tube is surrounded by another tube at some distance from it, so that it is not contacted by the fuel in the container. If the engine is now cranked by means of the electric starter,

heated oil is drawn from the heater tube into the inlet manifold and the engine, and it is claimed that when the mixture formed is forced into the preignition chamber during the following compression stroke, it ignites readily.

A number of interesting structural and other features can be seen from the drawing of this engine, Fig. 9. The upper half of the crankcase is cast integral with the cylinder block, while the lower half is in two castings. There are internal transverse fins in the lower half of the crankcase, extending over both parts thereof, and external longitudinal fins on the oil sump. The side walls of the block are nearly vertical, which should give relatively high rigidity, even though the block does not extend below the crankshaft axis. Counterweights are attached to the crank arm, and a Lanchester-type vibration damper is carried by the crankshaft at its forward end. The rocker arms and other parts of the valve gear are lubricated from the engine pressure system through the hollow camshaft and a tube extending up through the rear part of the engine housing from the rear cam-shaft bearing.

Labor-Employer Relations Report

(Continued from page 305)

record of handling labor disputes but the committee said it is generally believed there will be no repetition.

"The Government learned that drastic economic changes in policy should not be undertaken without the fullest consultation with both labor and employer organizations," the report declared. "Such consultation had been general throughout the war, and we were informed that today, before legislative or administrative action is taken that may affect labor, its continuity of employment, its wages, hours, cost of living, or working conditions, the views of labor and employers alike are invariably sought."

Members of the committee signing the report included Charles R. Hook, president of the American Rolling Mill Co.; Gerard Swope, president of General Electric Co.; Henry I. Hariman, former president of the United States Chamber of Commerce; Lloyd K. Garrison, Wisconsin law school dean and former chairman of the old National Labor Board; Robert Watt, American representative at the International Labor Office at Geneva; William H. Davis, New York attorney and former NRA deputy administrator; William Ellison Chalmers, assistant United States labor com-

missioner at Geneva; Mrs. Anna M. Rosenberg, regional director, Social Security Board, New York; Miss Marian Dickerman, principal of the Todhunter School, New York and a representative of the AFL.

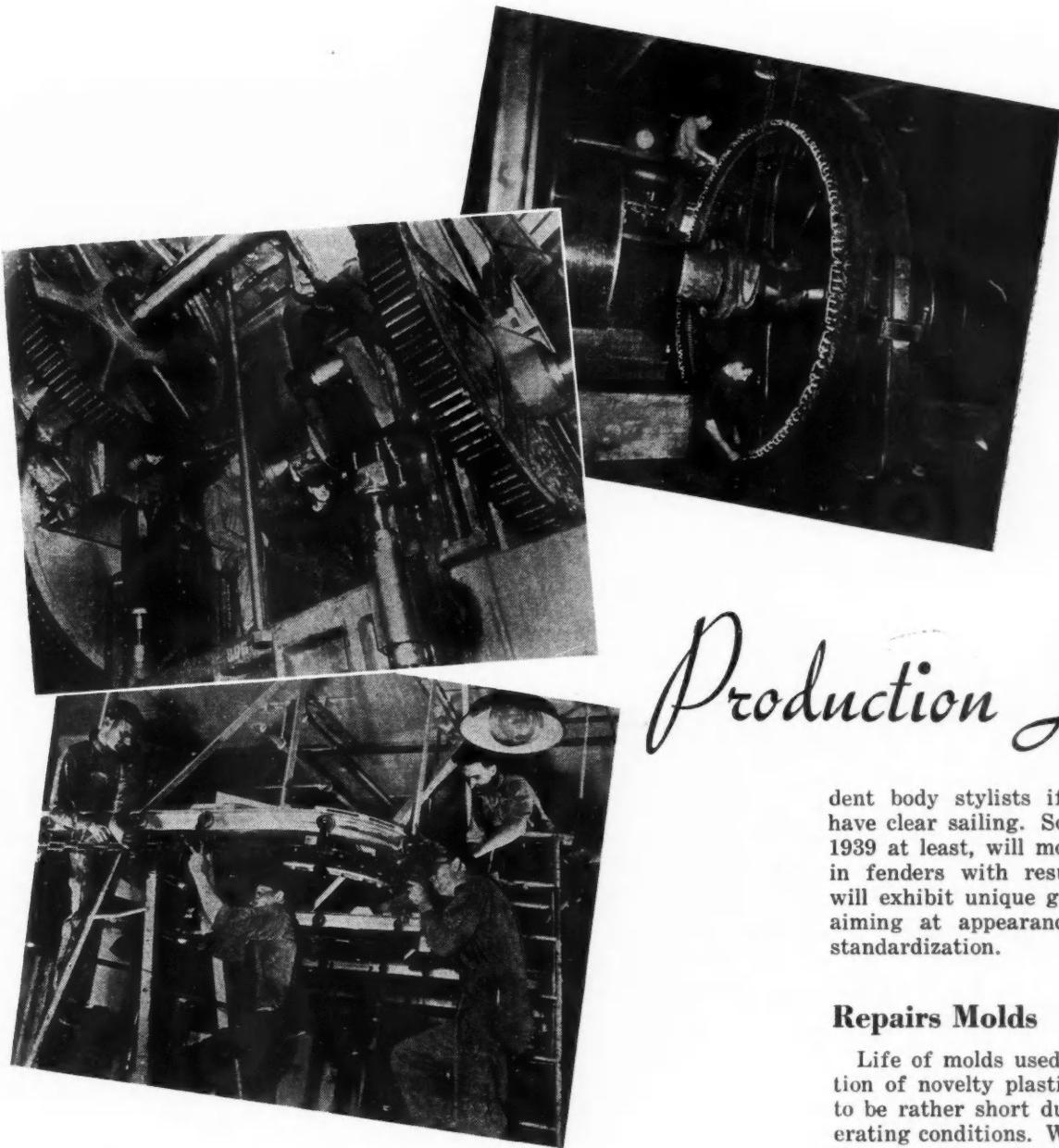
President Roosevelt, who expressed his appreciation of the commission's work, suggested when he released the report to the press that it ought to be read through.

"To me," he said, "the most salient feature of it is the cooperative spirit coupled with restraint which is shown by those who represent both employers and employees in Great Britain. Collective bargaining is an accepted fact and because of this the machinery which carries it out is functioning."

While there was much in the report to which the CIO could take vigorous exception and interpret as a reflection on their activities, there was also paragraphs which it could cite as bolstering its industrial union principle. For example, the report said there are three types of unions in Great Britain: the craft union, the industrial union and the general unions—a combination of unskilled workers and craft workers in unorganized areas, and that the acceptance and general practice of

collective bargaining on "an industry basis" places upon the employers and workers organizations, due to the sheer numbers of men and the magnitude of interest involved, a heavy responsibility calculated to call forth patience, understanding and a desire to make and keep agreements and to achieve industrial peace. Employers repeatedly informed the committee, the report asserted, that they preferred strong unions to weak ones and likewise the labor representatives said they preferred strong employer organizations, because the stronger the organization the fewer the units which remain outside to undermine industry standards.

More significance has been attached to the report because of the CIO opposition than because of any concrete evidence that it would actually lead to Wagner Act revision. Aside from refusing to name a CIO representative on the commission, the John L. Lewis organization later charged that the study had been suggested by Board Chairman Tom Girdler, of Republic Steel Corp., who, the CIO paper said, approached Mr. Hook, president of the National Association of Manufacturers, and asked for aid in financing the project.



Production Lines

At this time practically all of the automotive plants have been getting a thorough going-over in preparation for the production of 1939 models. Here are some views taken at the Dodge plant. The stamping press is getting an overhaul. The big motor getting a new armature operates one of seven air compressors. The ten miles of conveyors are being re-timed and re-routed.

Radiography

Author Isenburger advises us that he has completed his bibliography on Industrial Radiography, intended as a supplement to his book on the same subject (1934). The compilation comprises 776 references on 52 pages. Available in microfilm or black and white prints from the American Documentation Institute, Washington, D. C.

Hand Brake

Prominent engineer who usually calls his shots accurately, prophesies

for our benefit that the next minor change will be relocation of hand brake. In his opinion the only logical place is in the center under the instrument panel. Mounting of transmission shift lever under the steering wheel will make this change quite simple.

Lamp Standards

For some time there has been a movement afoot to create an industry-wide standard for headlamp lenses and mounting. Unless we miss our guess, the committee should make an early contact with indepen-

dent body stylists if it desires to have clear sailing. Some makes, for 1939 at least, will mount headlamps in fenders with result that lenses will exhibit unique geometric forms aiming at appearance rather than standardization.

Repairs Molds

Life of molds used in the production of novelty plastic items is said to be rather short due to severe operating conditions. Welcome news in *Oxy-Acetylene Tips* is that many hundreds of dollars per year can be saved in maintenance cost by salvage operations employing Haynes Stellite welding rod for hard facing; and by repairing fractured sections by bronze welding with the acetylene torch.

Oil Filter

Good news for filter makers as well as car owners is evident trend to mount oil filters at the factory on jobs sold in the "dust bowl" country. When this news gets around, some time after the automobile shows, there will be an opportunity to sell such equipment on new cars not so equipped; also on cars of older vintage. Needless to say, this is one of the most constructive steps taken by the industry in the interest of its customers—and not expensive at that.—J. G.

Substitute Motor Fuels in France

AT a recent meeting of the French Society of Automobile Engineers a paper on National Motor Fuels was presented by M. Bihoreau, head of the technical section of the National Department of Liquid Fuels.

France in 1937 consumed 3,725,000 metric tons (1 metric ton = 2204 lb.) of liquid fuels, including 2,250,000 tons of gasoline. The tonnage of liquid fuel which must be imported, in either the crude or the refined state, is therefore very considerable, and to reduce it, it is necessary to either find petroleum deposits within the country or else to replace fuels of petroleum base by others that can be produced from raw materials of native origin.

Borings for petroleum have been made in various parts of France, and also in the French colonies. While several small oil fields have been discovered, at present none of these is producing.

Hydrogenation Too Expensive

The next possibility lies in the use of gasoline produced synthetically by hydrogenation, a process worked in Germany by the I. G. Farbenindustrie A.G. and in France by the Bethune and Lievin Works. After discussing some of the characteristics of this process, the speaker expressed the view that the application of this process in France would not be to the advantage of the national commercial balance, and it is, of course, with the object of improving the commercial balance that substitutes for petroleum products are being looked for. The reason is that France at the present time produces only about two-thirds of the coal she consumes, and while there are also some lignite deposits in France, the conditions under which motor fuel could be produced from these lignites by hydrogenation are not nearly as favorable as those in Germany. In producing motor fuel by the hydrogenation process, the heat value of the solid fuel consumed is between four and five times that of the liquid fuel produced. Hydrogenation is a very expensive solution of the substitute-fuels problem, which necessitates the investment of large sums. For instance, a report which the Falmouth Commission prepared for the

British Government estimated that an investment of £8 million would be required for a plant having a capacity of 150,000 tons of gasoline per year.

The investment required and the cost of production both are somewhat lower with the Fischer process developed in Germany, for the exploitation of which in France a plant has been built by the Courrières Kuhlmann Company. But while the cost is somewhat lower, the gasoline produced has a lower octane value and is therefore not of the same high quality as that produced by hydrogenation, which is excellent for aviation purposes. To produce quality gasoline by the Fischer process it must be partly cracked. The process, moreover, seems to be still in a state of evolution, and while up to recently it was carried out at atmospheric pressure, higher pressures are now being used, to improve the quality of the gasoline. The Fischer process produces a high-grade gas oil for Diesel engines, of high cetane number, but gas oil sells at lower prices and is more readily obtainable, and while the erection in France of hydrogenation plants for the production of aviation gasoline may be justified from the national-defense standpoint, there would be no justification for the erection of plants for the synthetic production of gas oil.

The production in France of benzol by gas works and coke plants amounts to about 75,000 tons per year. This is a small amount in comparison with the needs of the country in respect to liquid fuel, and shows that benzol can only be a "help-out" fuel in times of peace; in war-time benzol is used for other purposes.

A liquid fuel rather different from benzol is produced when coal is subjected to low-temperature distillation (900 to 1300 deg. Fahr.). In this process, from 7 to 8 per cent tar is obtained and between 60 and 70 per cent so-called semi-coke, the principal outlet for which is for domestic heating. This process has been developed mainly in England, where between 300,000 and 400,000 tons of coal are treated by it annually. In 1937 the production of synthetic gasoline by low-tempera-

ture distillation in Great Britain amounted to 3500 tons and that of low-temperature tar to 24,500 tons. Whether low-temperature gasoline can be counted on to add materially to the motor-fuel resources of France in the future depends very much on whether it will be possible to find a sufficient market for semi-coke as a fuel for domestic heating at acceptable prices.

Another possible source of motor fuel is oil shale, of which there are considerable quantities in France, in both surface and underground deposits. Most of them, however, contain only between 4 and 5 per cent of crude oil. It would be necessary to mine and treat between 40 and 50 tons of shale to obtain one ton of gasoline, and the price of the latter would become prohibitive. Starting in 1844, many attempts have been made in the past to work these shale deposits for the oil, but practically all have resulted in failure. The French production of gasoline from oil shale in 1937 amounted to between 4000 and 5000 tons, whereas 85,000 tons of gasoline was produced from Scottish shales last year.

Vegetable Oils for Diesels

Most of the vegetable oils produced by pressing oleaginous grains, at least those whose viscosity is not excessive, may be used as fuel in Diesel engines. The vegetable oils best adapted for the purpose seem to be palm oil and peanut oil. The consumption is about 10 per cent greater than with gas oil, owing to the lower calorific power. These oils, moreover, must be refined before they are used in engines, because they usually contain acids which would be likely to attack the engine parts.

It has been proposed to subject these grains to a carbonizing or coking process, which has the effect of cracking the oily constituents more or less thoroughly. The oil obtained is rather similar to crude mineral oil, and by distillation may be made to yield gasoline and Diesel fuel, which after a refining to eliminate oxygenized constituents may be used in engines. The residue of this process is a vegetable carbon adapted for use as fuel in the gas generators with which certain motor vehicles are now equipped.

This apparently very simple process is quite seductive, because it yields three fuels suitable for use in motor vehicles, viz., gasoline, gas oil or Diesel fuel, and a solid fuel for use in gas generators. The proportion of tar obtained, moreover, is larger than that obtained by pressing alone, but this latter advantage is doubtful if the object is to secure the greatest possible amount of liquid fuel suitable for use in engines. This is due to the fact that distillation of the tar obtained from the coking process leaves a solid residue and in tests has given only 11 per cent of gasoline or Diesel fuel, as compared with 18 per cent of fuel adapted for use in combustion engines when operating by pressure only.

Experiments are under way at present in the Sudan, under the auspices of the Minister for Colonies, with the object of determining the method giving the best results from the standpoints of economic efficiency and of quantity and quality of engine fuels obtainable. The use of vegetable oils as engine fuel is contemplated for the colonies in the first place, and it would be only in case of a possible overproduction that its use in France would be considered. The choice of the method of treatment, whether pressing or coking, would depend on local conditions, but the speaker said he had been greatly impressed by a statement which threw the problem in relief for a district in French West Africa where there was a production of 500,000 tons of peanuts in 1937: "Calories are rare in West Africa and to avoid wasting them it is always better to make use of native labor than to use calories in coking them." M. Bihoreau concluded his survey of this phase of the situation by saying the use of vegetable oil as a motor fuel is technically possible in colonies producing oleaginous grains. In recent years the price of these vegetable oils has been sometimes higher and sometimes lower than that of petroleum products inclusive of taxes.

Ethyl alcohol has now been used by French motorists in admixture with gasoline for a long time. Unfortunately the production of fuel alcohol in France has been subject to great fluctuations, having dropped from 4,200,000 hectoliters in 1935-36 to 2,400,000 hectoliters in 1936-37, which has greatly complicated the conditions of its distribution.

The principal source of fuel al-

cohol in France is the sugar beet. Other raw materials such as potatoes, grain and Indian corn might also be considered, if it were desirable to increase production. It does not seem that this development would be desirable, however, in view of the high cost of alcohol production by fermentation, which is considerably above the cost of gasoline even when the taxes on the latter are included. The only processes for the production of alcohol which should be developed are those which insure a sufficiently low cost. That

applies to synthetic alcohol, and it may apply to alcohol made from cellulose, if the manufacturing process for the latter is developed properly.

Synthetic alcohol is produced from the ethylene in coke-oven gases. When the latter are subjected to compression and cooling, with the object of extracting from them the hydrogen required for the synthesis of ammonia, ethylene may be extracted from them. This is later treated with sulfuric acid to obtain ethylene sulfate, which when

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A large, dark, textured graphic of a crankshaft is angled across the center of the advertisement. Below it, a smaller black and white photograph shows a worker in a hard hat and work clothes standing next to a piece of heavy machinery, possibly a forging press.

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treated with water gives ethylene alcohol and at the same time liberates the sulfuric acid. The Bethune Mines Company manufactures two to three tons of alcohol daily by this method. This process might be extended to other firms operating coke ovens, but the increase in the amount of fuel alcohol available would not exceed a few ten-thousand tons per year.

The hydrolysis of cellulose, that is to say, the treatment of wood with concentrated or diluted acids in order to produce sugars from

which alcohol can be produced by fermentation was proposed by Baconnet during the time of the Continental Blockade. Later he tried to ferment the sugar obtained and in 1819 equipped a factory for exploiting his process, but the yield was insufficient and the undertaking failed. The fact that since that time not a single industrial process has been developed indicates that the practical development of this chemical transformation is not particularly simple. Many attempts have been made and factories

equipped for the working of the process, but all undertakings of the kind ceased operations after a shorter or longer period. Various difficulties are encountered in connection with the process. Some of these are of a technical nature, because the yields vary with the kind of wood treated, and they vary even for one and the same tree according to whether the wood is from the trunk or from the branches. Moreover, the sugars obtained are not all fermentable so that the final yield in alcohol is more or less reduced. There are also industrial difficulties which derive chiefly from the acid character of the mash.

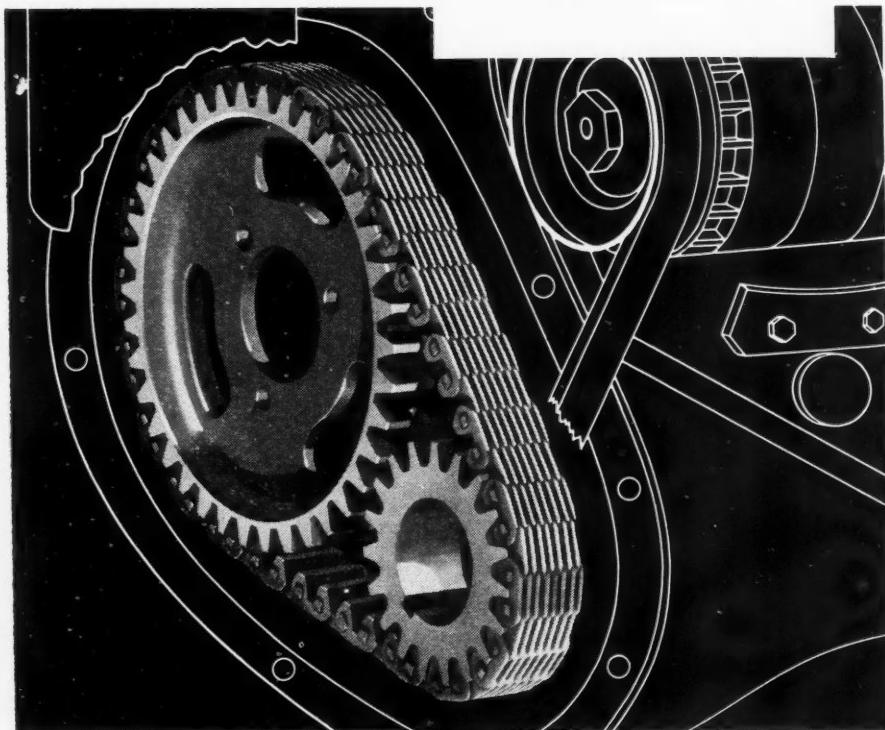
The most important difficulties to be overcome are of a chemical nature. They necessitate a systematic study of the reactions and of the products obtained. Such a study is being made by the Cellulose Division of the National Department of Liquid Fuels under the direction of M. G. Bertrand.

Methyl alcohol shares with ethyl alcohol the advantage of high anti-knock properties, but its heat value is even less than that of ethyl alcohol, and, besides, it is not miscible with gasoline even if completely anhydrous. A mixture composed of 15 per cent benzol, 15 per cent ethyl alcohol and 70 per cent methyl alcohol was experimented with by M. Dumanois in a vehicle for a long period, and gave the following results: The same power as with gasoline; the increase in the specific consumption was 33 per cent, which was considerably less than would be expected from the reduced calorific power, viz., 42 per cent.

For a long time methyl alcohol was produced solely by the distillation of wood, in necessarily limited quantity, because it does not constitute the principal product of the operation. For about a decade now it has been produced synthetically, by subjecting gaseous mixtures of carbon monoxide and hydrogen under pressure to a catalytic treatment. There are several such installations in France, which make available for use as motor fuel from 5000 to 10,000 tons of methyl alcohol per year. The production of alcohol by this process could be readily extended, but it does not seem that it is the best process for the production of motor fuel from coal. For a given heat value in the liquid fuel it takes about as much coal as for the same heat value in synthetic or hydrogenation gasoline, and the methyl alcohol is less desirable as a motor fuel by reason

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of its lower heat value per unit of volume.

As regards the use of compressed coal gas for the propulsion of vehicles, it might lead to an important reduction in the imports of crude oil and of gasoline. The development of this type of transportation depends very much on the price of the gas, which must be quite low in order to show a saving over gasoline. According to a calculation made in 1935, in order that coal gas may compete with gasoline, it was necessary at that time for gas to

sell at not more than 0.80 franc per cu. meter in the compressed state, equivalent to 0.40-0.50 franc at the gas works. These figures need be increased only slightly to take account of the increase in the price of gasoline since that time.

The author also discussed gaseous and solid fuels at some length, the latter for use in gas generators, and came to the conclusion that the only solutions of the problem of reducing petroleum imports which are capable of an immediate application are the use of gaseous fuels carried

in containers under pressure, of gas generators, and of electric power. These three sources of power may, moreover, be developed in parallel, their fields of application being different. Vehicles equipped with gas generators are particularly adapted for use in the open country; by reason of the ease of recharging they can cover long distances. Vehicles equipped with gas bottles and with electric batteries are better adapted for use around central charging stations. The former have a greater radius of action, while electric vehicles are best adapted for use in cities and for work with frequent stops.

In concluding his paper M. Bi-horeau said it was to be hoped that the use of these vehicles would increase, and efforts made to accomplish this purpose would certainly bear fruit, but it would be harboring dangerous illusions to imagine that France had the means of doing away entirely with imports of petroleum products.

Chrysler Engineers Develop a "Superfinish"

(Continued from page 318)

TIVE INDUSTRIES since its early beginnings were described in this publication several years ago. Our readers are familiar, too, with the fact that the Profilometer is capable of giving reproducible readings in micro inches—the millionth part of an inch.

As typical examples of Chrysler practice, we have shown in Fig. 1 the Profilometer readings on a number of production parts before and after Superfinish treatment. Fig. 2 shows the character of a typical turned surface as explored with the Profilometer. The successive sketches show how the surface is improved by Superfinish with increasingly greater time cycles.

Fig. 3 shows the arrangement of oscillating tool holders for finishing the brake drum contact surface.

In addition to the foregoing illustrations, we have reproduced a group of photographs of newly developed production equipment built by Foster which is being installed at the Chrysler Jefferson plant. Explanatory captions tell the story.

Signing of a contract between the United Rubber Workers of America and the United States Rubber Co., covering the company's large Detroit plant, has been announced by Sherman H. Dalrymple, URWA president.



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